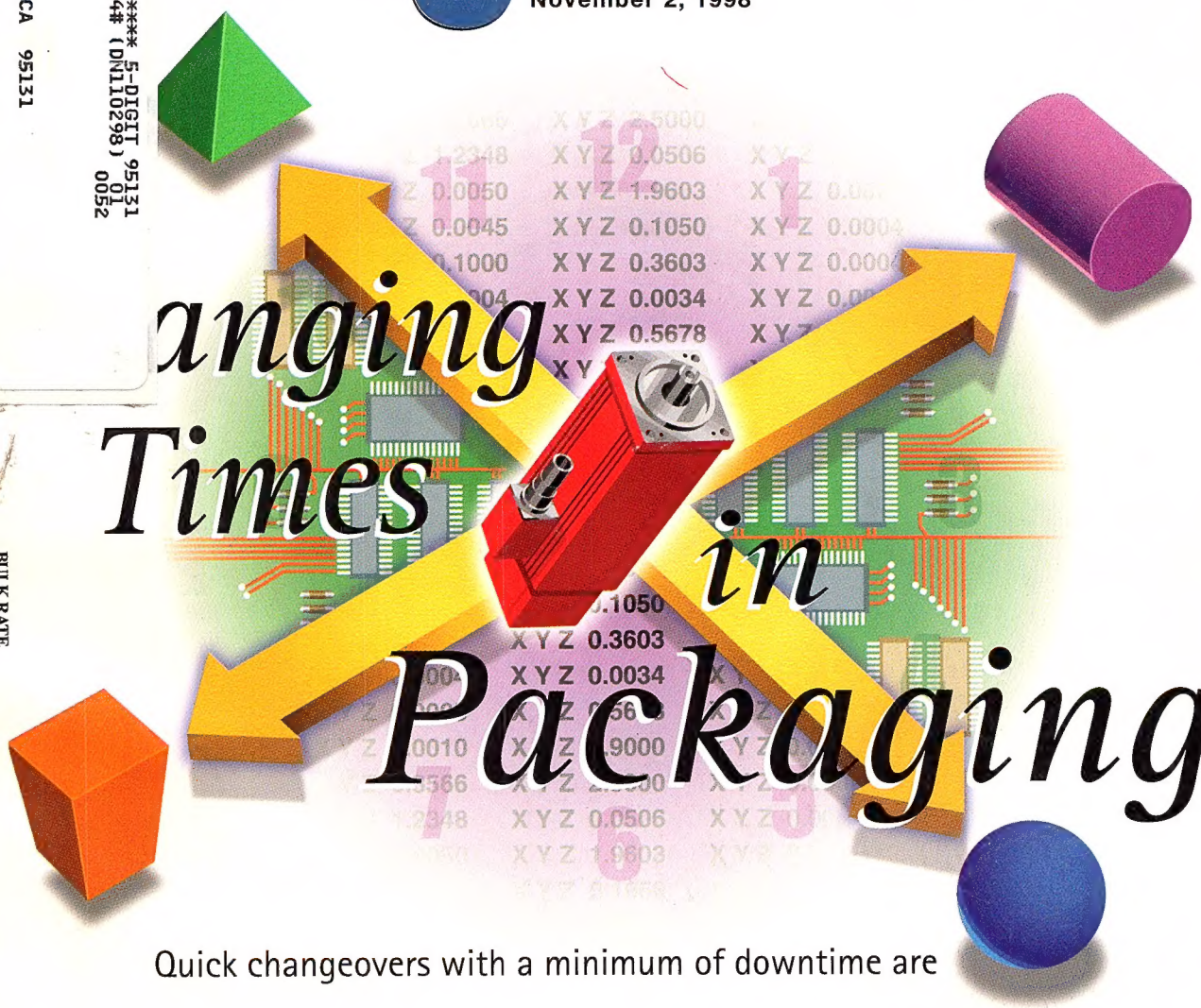
Cahners

www.designnews.com

design news

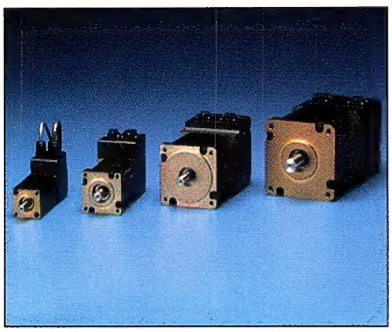
November 2, 1998



Quick changeovers with a minimum of downtime are critical in the packaging industry. Without the ability to make those changeovers fast, companies risk disappointing their customers and damaging their own bottom lines. Here are the latest technologies helping packagers compete.

Introducing...

THE EVOLUTION OF BRUSHLESS LINEAR AND ROTARY MOTORS

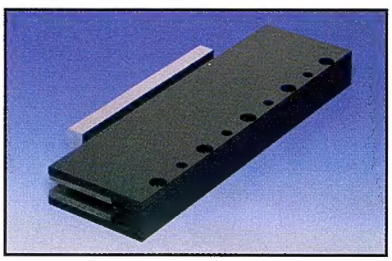


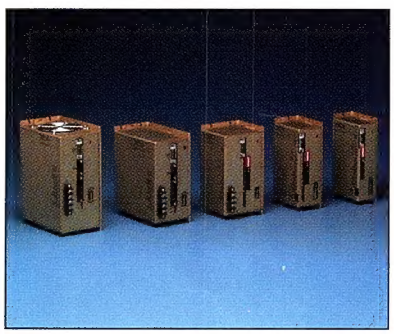
"ULYSSES" Brushless Servo Motors

- Continuous torque up to 90 lb-in. (superior thermal management)
- NEMA 17, 23, 34 & 42 frame sizes
- NEMA & metric mounting
- High torque to inertia ratio
- Sealed for washdown
- Matching amplifiers
- *Options are modular & field upgradeable:* encoder, resolver, brake & MS connector

"HERCULES" Brushless Linear Motors

- Continuous force up to 38 lbs.
- Higher performance (superior thermal management)
- Built in cooling system (no hoses)
- *Modular* design: stackable "end to end"
- Matched sine wave drive optimum efficiency
- Least number of wires in the industry





"ODYSSEY" Brushless Servo Amplifiers

- Continuous current ratings up to 10 amps
- Output voltage up to 300VDC; DC or AC input
- Compact
- Accepts +/- 10VDC analog input
- Transconductance or velocity
- Independent current & velocity loops
- *Options* are *modular* & field *upgradeable:* encoder, resolver, sine wave & digital

MFM PROVIDES VALUE:

IN PRODUCTS

- Designed to meet UL & CE
- 2 year warranty
- Efficient designs - DFM & DFA
- Designed using FMEA

IN ENGINEERING

- Modifications
- Custom design
- Value engineering
- Superior application engineering

IN ORGANIZATION

- Established in 1975
- 24 hour on-line technical support
- CIM - year 2000 compliant
- Follows the guidelines of ISO/QS 9000

MFM TECHNOLOGY

Enabling the Brushless Age

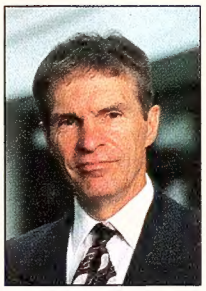
1-800-MFMOTOR
636-6867

www.mfmtech.com

Fax: (516) 467-5176
email: app-eng@mfmtech.com
Circle 800

Call For Free Motor Sizing Software

Quick-change Artistry Comes to PACKAGING



Paul E. Teague
Chief Editor

Servo motors, software, and other technologies are simplifying changeovers on packaging lines

For increased efficiency, and to meet the demands of consumers, companies must be able to quickly change their packaging lines to accommodate different sizes and shapes of packages. No longer can they survive with the downtime formerly associated with these changeovers—the realities of today's marketplace simply won't allow that. In this special *Design News* supplement, we describe the new technologies that are changing the packaging industry.

First, Contributing Editor Vickie McConnell provides an overview of trends in packaging technology and the impact that technology is having on the industry. Next, contributor Alice Lium describes the latest in servo motor technology and how packagers are using it to improve speed and gain flexibility. Senior Editor Charles J. Murray follows with an inside story on how Klockner incorporated servos in a new cartoning machine to improve performance for customers such as Kraft and Nabisco.

Next up, Contributing Editor David Stern describes the latest in software for packaging applications. Then, Contributing Editor Yvonne Bernard reminds us of the latest enhancements in the traditional mechanical technologies in packaging, such as brakes and clutches. Finally, we have an interview with Dan Throne, packaging industry business manager for the Indramat Division of Mannesmann Rexroth. All in all, we think you'll find this supplement a comprehensive and informative document. Let us know your opinion.

Paul E Teague

Inside

How to Reach Design News

Cahners Business Information
A member of the Reed Elsevier Group
275 Washington Street, Newton, MA 02458
617-964-3030 FAX: 617-558-4402, or
e-mail: dn@cahners.com
Web site: http://www.designnews.com

Supplement Editorial Staff
Paul E. Teague, Chief Editor
Deana L. Colucci, Supplement Manager

Charles J. Murray, Senior Editor
Yvonne Bernard, Contributing Editor
Alice Lium, Contributing Editor
Vickie P. McConnell, Contributing Editor
David Stern, Contributing Editor

Graphics
Norman Graf, Director of Creative Services

Alison Lutes, Senior Art Director
Chuck Mackey, Senior Art Director
Scott Raymond, Associate Art Director

Production
John R. Sanders, Director, Prod. & Mfg.
Susan Johnson, Production Coordinator

Sales
Michael Paul, Supplement Sales Coordinator

Bruce Barnet, President/CEO
Jackie Daya, Exec.V.P./Finance & Administration
Andrew Weber, Executive Vice President
Russell A. Piersons, Group Vice President
Lawrence D. Maloney, Vice President, Publisher, and Editorial Director
Vincent Cavaseno, National Sales Manager

Cover illustration: Doug MacLaughlin

machine logic™

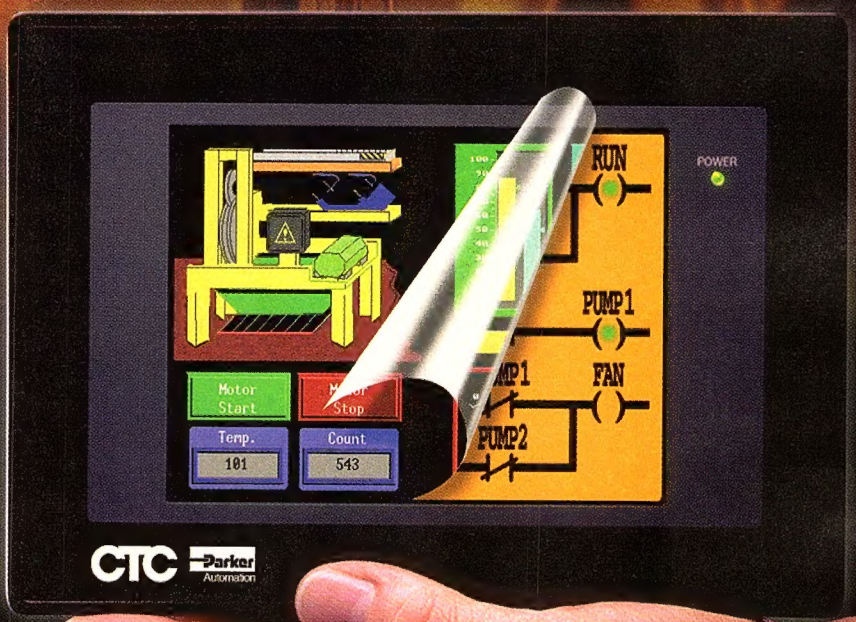
CTC Parker Puts...

PC Based Control In The Palm Of Your Hand

True Hard Real Time

Deterministic Operating System (Not Win NT)

Runs From Solid State Flash For Increased Reliability



On Line Editing

IEC1131-3 ALL 5 Programming Languages

Machine Logic™ is a PLC replacement control software specifically designed to cost-effectively meet the demanding OEM machine requirements. When used with *INTERACT*, the #1 rated machine control MMI, and running on PC based PowerStation hardware, OEM's have an integrated solution for any size machine.

For more information on Machine Logic™ or to request an Evaluation CD:

- *Call:* **1-800-233-3329**
- *Email:* **moreinfo@ctcusa.com**
- *Or visit our web site:* **http://www.ctcusa.com**

CTC Parker Automation

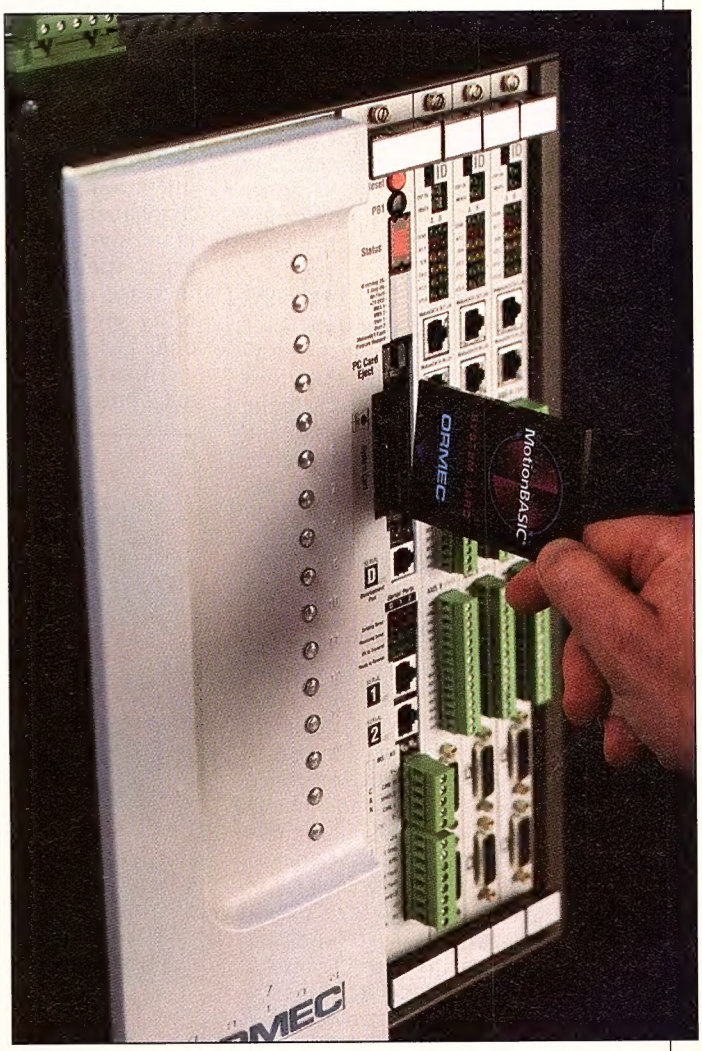
50 W. TechneCenter Drive • Milford, OH 45150
Phone: 513-831-2340 • Fax: 513-831-5042
Internet: http://www.ctcusa.com

Circle 803

Automation advances *drive equipment design*

Servos, software, and systems integrators are helping OEMs engineer electronic solutions and enhance core manufacturing technology

Vicki P. McConnell,
Contributing Editor



Plug 'n play: ORMEC's MotionBASIC system card fits easily into motion-controller hardware, incorporating setup parameters and user data along with PC and factory network links.

The technology evolution in the packaging industry away from mechanical line shafts and geartrains and toward electronically automated machines has reached a midway point. Servo-driven motion control systems, user-friendly and programmable software, and factory network protocols are bringing the once future vision of global machine connectivity closer at hand.

That's the consensus of OEMs and motion control system suppliers surveyed here. They report that the goal of packagers is to plug in modular automation electronics, program them easily with nominal debug, and restart production lines at faster operating speeds for increased throughput. From high-speed servo motors to feeders, fillers, sealers, baggers, and cartoners—with labelers, inserters, conveyors, robots, and weigher/inspectors in between—packagers also want real-time monitoring, on-line multi-layered diagnostics, and remote troubleshooting. Beyond that, they want rapid changeover capability to produce various product sizes, shapes, and volumes.

These demands have pushed OEM engineers in the direction of consumer product trends by designing "plug-and-play" automation features into packaging equipment. Of paramount importance: the ability to add precise, fast axes of motion; and to achieve ready connectivity or controller communication among various machines—often from multiple vendors.

Plug-and-play hardware elements delivering this level of

VENDOR-SUPPLIED CASE HISTORY

Performance upgrade at minimal expense

A manufacturer of multiple-axis machinery (as many as 20 axes per machine) began experiencing procurement and maintenance problems with a brush motor/tachometer assembly it has been using for many years.

With some 10,000 motor/tachs installed, the brush maintenance had become unacceptable. In addition, due to vendor corporate problems, the assembly became more expensive and less available as time passed.

So a decision was made: upgrade and seek an alternate source. Brushless technology was immediately considered, but would require replacement of all the servo amplifiers and the entire harness assembly in each machine, as well as the motor/tach assembly; a formidable and expensive task, especially on machines still under warranty.

Brushless technology, therefore, was ruled out, until the manufacturer became aware of MFM Technology's Brushless Plus motor technology.

MFM designed a brushless motor/tachometer assembly that allows direct replacement on the existing brush-based assembly. Both assemblies are the same length. In the volume which used to house the brush/commutator bar components for the motor and tachometer, MFM has packaged a Brushless Plus Module for the motor and the synchronous rectification circuitry for a three-phase brushless tachometer.

The motor/tachometer assembly provides a rating of 6A continuous, 12A peak; and a tachometer gradient of 7V/1,000 rpm, directly duplicating the brush motor/tach specifications.

The assembly is driven by the existing 10 KHz, PWM "H" drive amplifier, with a 120V dc bus. Since the motor-mounting details, pilot, and shaft match the brush assembly, they can be easily mounted on existing equipment.

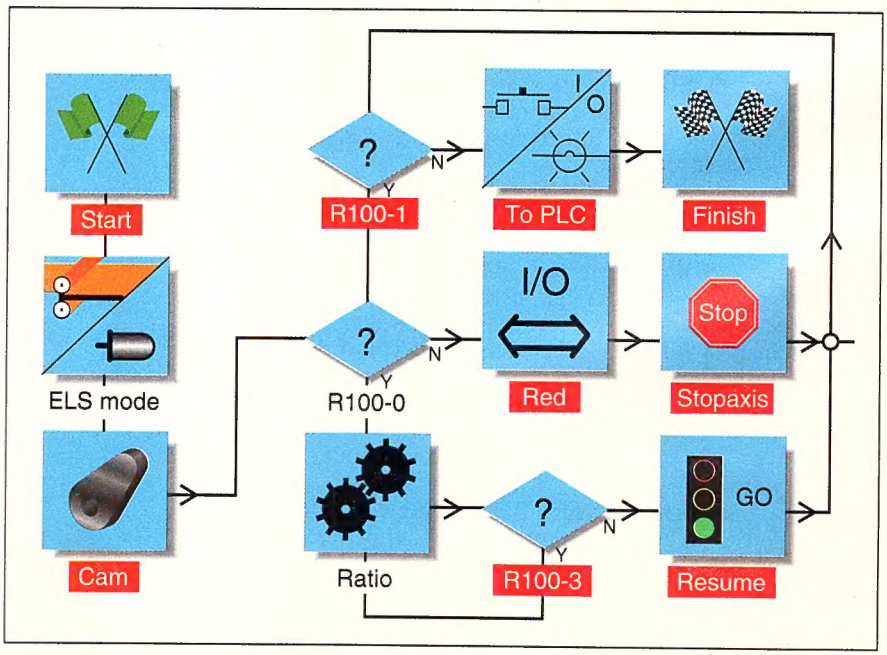
And because motor life is now determined primarily by the bearing structure, the manufacturer can offer a performance upgrade at minimal expense. It has also reduced warranty costs and can switch to brushless technology on new equipment without design changes in the existing amplifiers or harness assembly. Circle 800

Look and feel HMIs: ORMEC's flat-panel QuickPanel touch screens make operational programming and on-the-fly changeover push-button easy with high-resolution color and alarm/status lights.

functionality include PC cards, ISA adapters, I/O, and axis modules that can be installed to provide electronic gearing, camming, and line shaft operation; as well as unlimited, filtered analog and digital I/Os. I/O command signals can be isolated to reduce error-inducing ground loops and increase noise immunity—at repeatability speeds to within 2.25 milliseconds per channel.

Software segue. Hardware makes machines perform, but the ability to store and manipulate operating data for every production project is a software function. Adding automation on a packaging line (either in new equipment design or as a retrofit of existing machines) requires communication between vendors' proprietary and closed "firmware" (protected device-specific operating source codes) and operating software.

Third-party software packages that utilize Windows/icon-based programming (such as Microsoft's Windows,



Indramat's 'point and click' user interface with pull-down menus and functionally oriented icons runs on any IBM-compatible PC with Windows-based software.

Excel, and Basic) provide a user-friendly means for handshaking firmware and proprietary software. Among motion control system suppliers: Control Technology Corp.'s programming software is Quickstep, whereas Thomson Motion Control Div. created OMNI LINK™, Baldor Motors & Drives features MINT, Indramat provides Visual Motion, and ORMEC uses Motion Basic. Each offers a full range of features to accommodate ease and simplicity in programming.

Depending upon the production line configuration, controllers to run the software may include programmable logic controllers (PLCs), host personal computers (PCs), independent motion controllers, and human/machine interfaces (HMIs or touch screens). Advances in touch screen technology emphasize the importance of the human operator, with screens that are brighter, smaller, more portable, and can include embossed or tactile data entry and function keys. Among the latest bells and whistles are high-resolution color graphical displays, point-and-click icons, pull-down menus, and pilot lights. Progressive operating instructions may be presented as flow charts; successive function steps, tasks, or threads; intuitive two-to-three-letter commands with legends; and mapped transparent background communication; all supported by Help files. Among the common third-party HMI software packages available today are those of Intellution and Wonderware.

More axes, please. According to Mike Backman, manager of Thomson Motion Control Div. (Port Washington, NY), piece-part automation with stand-alone, single-axis servo motors and controllers served as a first step toward upgrading fixed-speed dedicated machines performing the repetitive, linear motions that characterize most packaging operations. However, "as packagers must now handle many different sizes of packaging in various runs per day," they are seeking multi-axis system solutions offering both discrete and coordinated control of specific motion elements.

This has resulted in one clear trend among end users: new purchases of motion control elements already begin with 3 to 5 axes specified per machine—up from 1 to 3 only a few years ago, and going as high as 15 axes on a cartoner or product feed system.

More axes means more motors, with brushless, digital servos and drives taking over power transmission from traditional ac/dc rotary motors at an unprecedented level of speed, precision, and reliability. This is essential to providing rapid product changeover "where servo-driven motion control systems offer flexibility through programmable, coordinated multi-axes motion," says Backman, "such as master/slave setups where one motor follows another precisely with the controller tracking position and speed. Servo-driven linear slides also excel at repetitive motion (see sidebar)."

Additional programmable servo options include jogging, which allows any axis to move at a constant speed for

VENDOR-SUPPLIED COMPANY PROFILE

Company supports product history

Animatics produces the SmartMotor™, which began with the introductory NEMA 23 back in 1995 and has expanded to more than a dozen models in NEMA frame sizes 17, 23, 34, 42, and 56. Because of its high level of integration, the SmartMotor takes a completely different approach to motion control.

Fortunately, the SmartMotor design was a success. It won vast acclaim from industry journals, distinguished with "product of the year," "best products of 1995," and "honorable mention," among others.

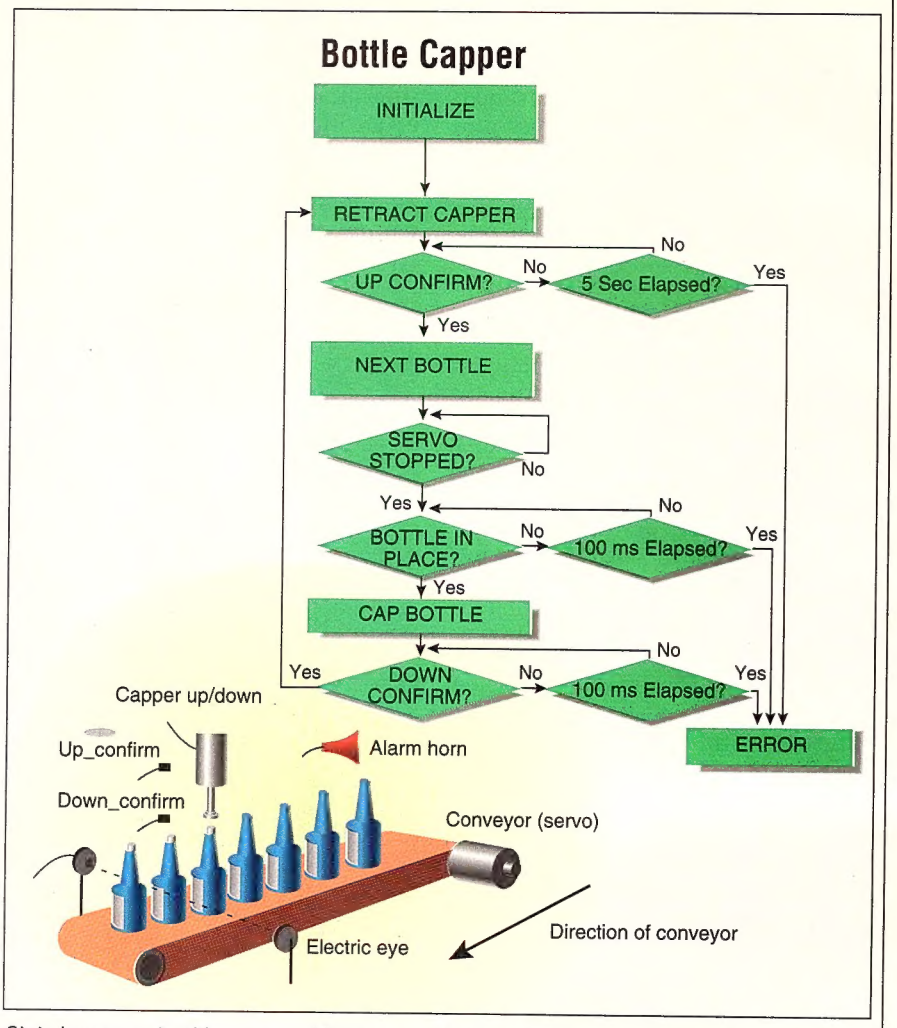
Quickly following its introduction, the SmartMotor caught on in the industry because its simplicity shortened normally long customer design cycles. This drove the demand for the SmartMotor line, which lead to an expansion through to the integral horse power versions including both the 42 and 56.

The SmartMotor brushless dc servomotor was not the first innovation from Animatics. In business for more than 10 years, Animatics has won the distinction of being number 212 on the *INC500* list of the fastest-growing private companies in the nation. The company was also recognized by the *San Jose Business Journal* as being the 29th fastest-growing private company in Silicon Valley, winning the "Business Journal 100" award.

Animatics achieves these recognitions by managing a contradiction: While it is a fast-paced company with leading-edge products, it is also a solid organization still supporting products from more than 10 years ago.

When an OEM chooses a servomotion control system for a new product, more important than innovation is the promise of support over the long product life cycles.

SmartMotor 17 includes a controller, amplifier, encoder, PLC, power supplies, and a network manager. The units take up to 12A of peak current and are built into a finned square-frame housing for maximum heat dissipation and continuous power. Model 17 is for point-to-point positioning and holds precise velocities to driven accuracies. Circle 805



State language, intuitive step architecture, and flow-chart tutorials characterize Control Technology Corp.'s Quickstep programming as applied to executing bottle capping on a packaging line.

an indefinite time. Servo controllers can be daisy chained for control through a host PC or by each other. All servo motors contain embedded CPUs and feedback elements—encoders are popular—which make them "smart" motors and enable more complex modes of motion and the ability to read the load position at speeds up to 1,000 times/second. Digital signal processors (DSPs) are the most recent form of embedded processor.

Integral torque limiting is available, "which provides a major safety benefit," says Kelly Meer, senior engineering specialist for Doboy, a division of SIG Pack Inc. (New Richmond, VA). "With this feature, a servo motor can be programmed to stop if it is overloaded by something that gets past safety guarding and caught in the drive mechanism, like a tool or errant part."

The cumulative effect of this technology is better line efficiency: reduced set up time, fewer stops/starts and bottlenecks, and less maintenance and repair. "Most packaging machines are cycling at high rates," Backman adds. "So reliability and low maintenance are important issues. Digital servo-driven systems nearly eliminate maintenance such as recalibration, part changeout for wear or lubrication, and adjustment for tolerance."

"Line efficiency translates to maximized uptime," observes Dean Mannlein, president of Automated Motion Inc., a systems integrator and equipment retrofitter (Baltimore, MD). "Minor improvements in efficiency can result in major improvements in throughput." He points to current pack-

SMART Motor™

ALL IN ONE!

The Animatics SmartMotor™ is an entire servo motion control system in a single component designed for compact, high reliability O.E.M. equipment. It combines a brushless D.C. servo with a 32-bit controller, amplifier, encoder, network manager, RS-232 channel and program interpreter. This final level of servo integration achieves four goals . . .

Family of SmartMotors
Available in sizes 17, 23, 34, 42, & 56!

- ◆ Increase Throughput
- ◆ Increase MTBF (reliability)
- ◆ Reduce Costs
- ◆ Reduce Development Time

Applications

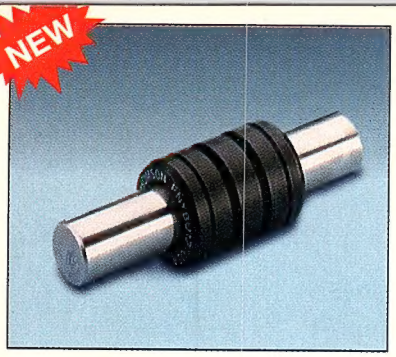
- ◆ Automation
- ◆ Feed-to-length
- ◆ Flat-Panel-Display Process Equipment
- ◆ Food Processing
- ◆ Labeling Machine
- ◆ Machine Tools
- ◆ Medical Equipment
- ◆ Packaging Equipment
- ◆ Photonics
- ◆ Pick-and-Place Equipment
- ◆ Printing (Industrial)
- ◆ Pump
- ◆ Remote Control
- ◆ Robotics
- ◆ Scientific Equipment
- ◆ Semiconductor Wafer Process Equipment
- ◆ Textile Equipment
- ◆ Welding Equipment
- ◆ And many more!

Call Now For A Full Line Catalog!
Circle 805

ANIMATICS®

Animatics Corporation
3050 Tasman Drive
Santa Clara, CA 95054
Tel 408.748.8721
Fax 408.748.8725
www.smartmotor.com

NEW



SELF-LUBRICATING FLUORONYLINER* BUSHING BEARING

Self-lubricating, polymer-lined bearings. They are the choice for smooth and even motion in water washdowns, contaminated, or high temperature environments. New technical bulletin provides complete engineering selection and specification data for bearings and pillow blocks.

LINEARFAX NO. 43975
1-800-55-4-THOMSON

Circle 808

SAGINAW* AND IBL* BALL SCREWS

- Over 90% efficient
- Accuracies up to .0002 in./ft.
- Standard screws available off the shelf
- Tubular and multi- extend screws available
- Custom screws quoted to customer specification

LINEARFAX NO. 10675
1-800-55-4-THOMSON

Circle 809

60 CASE* LINEARRACE* SHAFTING

The new 60 Case LinearRace shafting catalog includes 17 custom-machined CAD templates that can be modified by hand and faxed to Thomson for quick and easy quoting. Specifiers have a choice of 178 different shafting sizes and materials that are available from stock. Photographs, drawings and graphs show how properties are measured and what specifications ensure full system life when Thomson 60 Case LinearRace is used as the inner race of linear Ball Bushing* bearings.

LINEARFAX NO. 10175
1-800-55-4-THOMSON

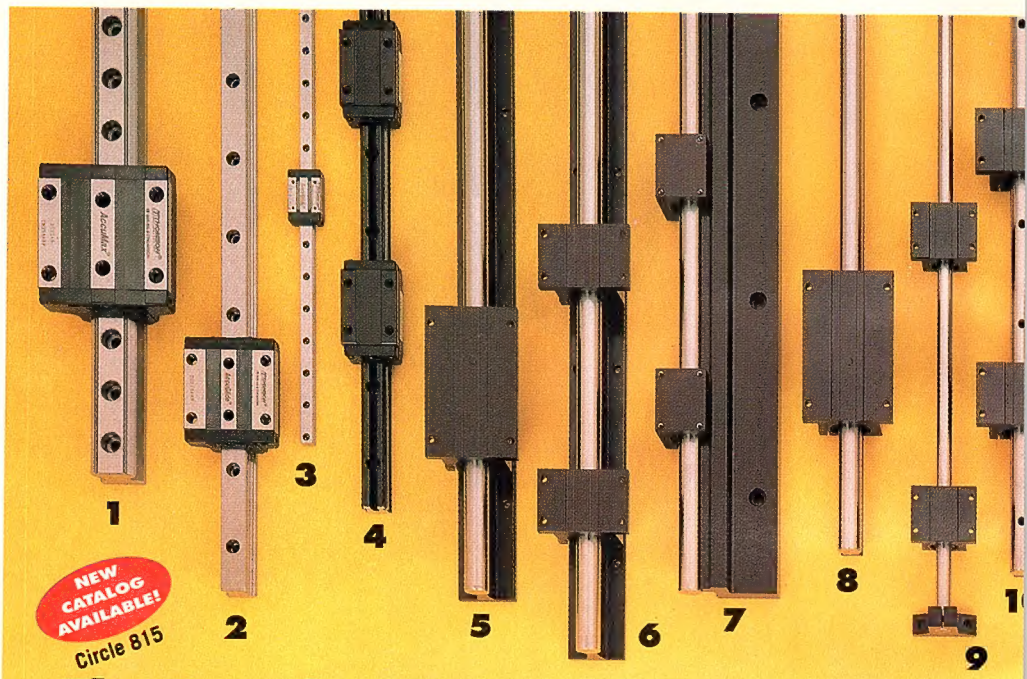
Circle 807

ADVANCED LINEAR MOTION SYSTEMS, SLIDES & STAGES CATALOG

New catalog provides the latest linear motion systems available from Thomson Industries. Thomson systems are available in both inch and metric sizes for both continuously- or end-supported applications. Drive options include manual, belt-driven, ball screw-driven, and pneumatic. Catalog also covers system accessories, and a new electronics section featuring AXI-PAK* Plug and Play motion control products.

LINEARFAX NO. 10375
1-800-55-4-THOMSON

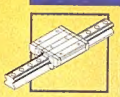
Circle 806



The Broadest Range of Linear Guides..

You'll find the best solutions where you find the best alternatives. That is why Thomson has developed the broadest range of different RoundRail* and ProfileRail* linear guides. Since we don't favor any particular type, you get the best recommendation and technology for your application. Call us for objective advice backed by over 50 years of experience.

1 AccuMax*



High loads, extreme precision, high rigidity: Our patented Arcuate Advantage* eliminates roller skewing and edge loading, assuring smooth, accurate, predictable motion.

LinearFax No. 37975

2 AccuGlide*

Industry standard envelope, interchangeable components: AccuGlide linear ball guides offer the only U.S. manufactured and supported alternative, with the advantage of component interchangeability in all accuracy classes and preloads.

LinearFax No. 37875

3 AccuGlide (Mini)

Ultra compact, high roll moment capacity: Patented AccuGlide miniature linear ball guides feature a superior ball control design for smooth, quiet, low-friction operation.

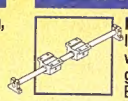
LinearFax No. 37775

8 Bolt-From-Bottom

Enhanced sealing, low cost installation, highest loads, longest travel life: Well suited for harsh environments Super Smart Ball Bushing pillow block bearings offer up to 6X the load capacity or 216X the travel lifeof conventional linear bearings.

LinearFax No. 81175, 81275

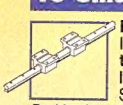
9 End Supported



Industry standard, longest travel life while spanning a gap: Super Smart Ball Bushing pillow block bearings on 60 Case* shafts for up to 6X shaft life or up to 216X the bearing life.

LinearFax No. 31675, 31775, 31875

10 Smart Rail*



Bolt-from-the-top, low cost installation, highest loads, longest travel life: Super Smart Ball Bushing bearings enable low cost installation from top down mounting, universal self-alignment, and the RoundRail advantage. Load capacities comparable to Profile Rail linear guides.

LinearFax No. 35975, 36075

11 RoundWay*

Highest loads, contamination resistant, most rugged, fastest speed and acceleration: RoundWay* linear roller guides handle up to 35 tons/brg and speeds up to 100 ft/sec. They are insensitive to rail alignment errors.

LinearFax No. 81375

15 Double End Support

NEW

High roll moments, longest travel life while spanning a gap. Complete axis solution: Self-aligning for smooth motion under deflection. Pre-engineered, pre-assembled for low cost mounting.

LinearFax No. 32675

16 Double Continuous Support

NEW

Highest load capacity, longest travel life, rigid: Super Smart Ball Bushing pillow block bearings mounted to continuous shaft rail offer up to 6X the capacity or 216X the travel life of conventional linear bearings.

LinearFax No. 33675

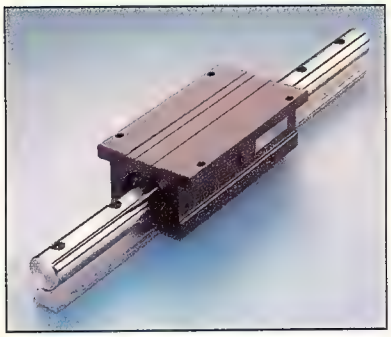
17 MicroStage*

NEW

Industry standard, most compact, extremely smooth, complete axis solution: Pre-engineered, pre-assembled for low cost mounting, lightweight design significantly reduces inertia.

LinearFax No. 81075

Best of the Best
SM
SUPPLIER OF THE YEAR
THOMSON

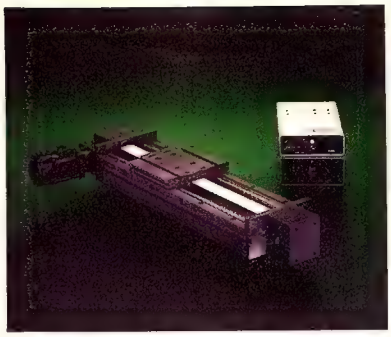


SMART RAIL* LINEAR GUIDES

- Pre-engineered, pre-assembled, ready-to-ship, ready-to-install
- Convenient bolt-down-from-the-top mounting
- Self-aligning pillow blocks for easy, inexpensive installation
- Load capacities to 27,000 N (6,000lbf)
- Includes Super Smart Ball Bushing* bearings

LINEARFAX NO. 18675
1-800-55-4-THOMSON

Circle 810

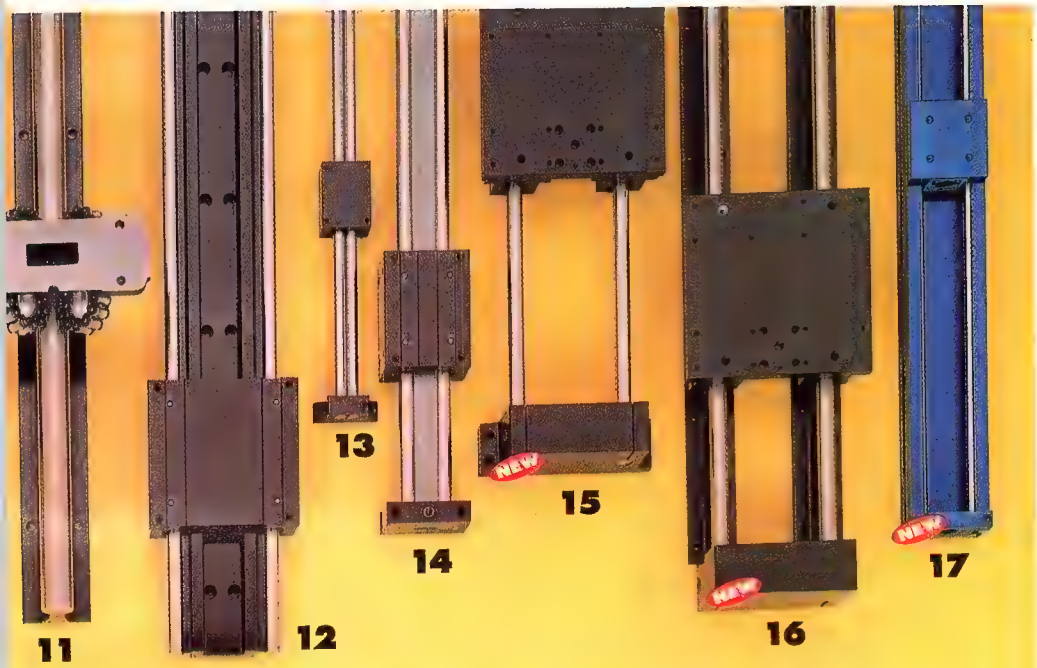


LINEAR MOTION SYSTEMS, SLIDES & STAGES

- Pre-engineered, pre-assembled, ready-to-ship, ready-to-install
- Available in inch and metric sizes
- Drive options include manual, ball screw driven, belt driven, and pneumatic actuators
- Easy bolt-down installation
- Available in standard lengths

LINEARFAX NO. 10375
1-800-55-4-THOMSON

Circle 811



from the Leader in Linear Motion.

4 T-Series

Low cost, highest performance/cost ratio, industry standard envelope: Patented AccuGlide T-Series* linear ball guides offer lower purchase price and installation cost with the high load capacity of traditional ProfileRail linear guides.

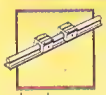
LinearFax No. 38175

5 FluoroNyliner*

Corrosion resistant, industry standard, operates at temperatures up to 550°F: Patented self-lubricating polymer bearing linear guides are shock proof, smooth, quiet and insensitive to washdown conditions.

LinearFax No. 81575, 81675, 81775

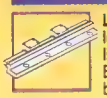
6 Continuous Support



Industry standard, highest loads, longest travel life: Super Smart Ball Bushing* pillow block bearings mounted to a continuous shaft rail assembly offer up to 6X the load capacity or 216X the travel life of conventional linear bearings.

LinearFax No. 37275, 81875

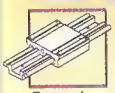
7 Side Mounted



Low profile, higher loads, longer travel life: Super Smart Ball Bushing pillow block bearings mounted to a continuous side mounted shaft rail assembly offer up to 6X the load capacity or 216X the travel life of conventional linear bearings.

LinearFax No. 32375

12 Dual Shaft Rail



High loads in all directions, complete axis solution: Pre-engineered, pre-assembled for low cost mounting. Carriage complete with Super Smart Ball Bushing bearings mounted to dual shaft rail assembly for easy installation.

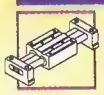
LinearFax No. 33375

13 Twin Shaft*

Compact, resists roll moments while spanning a gap, ultra-smooth travel, complete axis solution: Patented Twin Shaft guide is pre-engineered, pre-assembled for low cost mounting. Self-aligning for smooth motion under deflection.

LinearFax No. 32975

14 Twin Shaft Web



Resists high roll moments while spanning a gap, high rigidity, complete axis solution: Patented Twin Shaft Web guide is pre-engineered, pre-assembled for low cost mounting. Self-aligning for smooth motion under deflection.

LinearFax No. 33075

For the distributor nearest you, to place an order, or to access our LinearFax* Technical Data Service call:

1-800-55-4-THOMSON
(1-800-554-8466)

Fax: 1-800-445-0329
E-mail: linearguides@thomsonmail.com
Internet: http://www.thomsonindustries.com

*Trademark of Thomson Industries, Inc.
THOMSON is registered in the U.S. Patent and Trademark Office and in other countries.
HAP 9-9-98 9808-24.qxd

All Thomson Industries Manufacturing Locations are ISO 9000 Certified and Automotive Facilities Operate to QS-9000 Standards General Motors Supplier of the Year Since 1995

ISO 9000

THOMSON*
First in Linear Motion and Control Technology

Immediately Available!

Thomson Industries, Inc., 2 Channel Drive, Port Washington, NY 11050
9809-03C

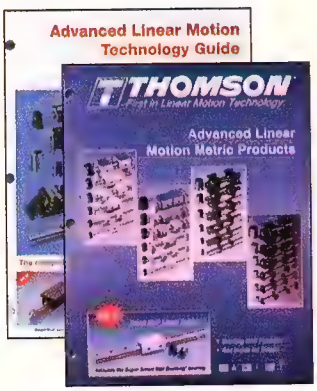
Circle 814

ADVANCED LINEAR ACTUATOR GUIDE

This technology guide is a complete source of information on high performance Thomson Saginaw* ball screws, including rolled thread assemblies, precision ground assemblies and ball splines. Also included are specifications, design and selection criteria and mounting instructions.

LINEARFAX NO. 10675
1-800-55-4-THOMSON

Circle 812



ADVANCED LINEAR MOTION TECHNOLOGY GUIDES

Thomson's new inch and metric technology guides provide engineering support data for the most complete range of RoundRail* linear bearings and pillow blocks in Imperial, ISO, and JIS standards, featuring:

- Super Smart Ball Bushing* bearing technology
- Smart MultiTrac Ball Bushing* bearings

LINEARFAX NO. 10075
1-800-55-4-THOMSON

Circle 813

■ VENDOR-SUPPLIED COMPANY PROFILE

Bearings boast long life

Packaging equipment designers and manufacturers are focused today on improving productivity and reducing production costs, a challenge Thomson Industries takes very seriously. With Super Smart Ball Bushing bearings, Thomson offers manufacturers the ability to reduce their linear motion product cost by up to 90%. This is possible through the bearings' high load capacity to use smaller, less expensive bearings, LinearRace shafts, and supports.

Thomson claims that the bearings, when used in place of other linear bearings, last up to 8x longer than those of its closest competitor. And when compared to the original Ball Bushing bearing, the Super Smart Ball Bushing bearings last up to 216x longer. This results in less downtime and lower maintenance costs.

In addition to their high-performance, Super Smart Ball Bushing bearings offer a universal self-alignment feature for ease of use. This makes the bearing less sensitive to misalignment caused by inaccuracies in the machined housing bores and/or bearing-mounting surfaces. OEMs are assured a smooth-running bearing that performs to specifications, without having to derate for misaligned conditions.

One problem that can occur with the use of self-aligning linear bearings is that the crown on the outer race tends to imbed into the housing over time, leading to the deterioration of the bearing/shaft fit-up, which can be critical in many applications. However, Super Smart Ball Bushing bearings typically maintain their bearing/shaft fit-up. This is possible because of a precision ring that provides a hard surface for the bearing's outer race to pivot against, virtually eliminating loosening up of the fit-up over time.

Finally, Super Smart Ball Bushing bearings are available with double-lip integral wipers that keep contamination out of the bearing. At the same time the wipers also retain internal bearing lubrication to increase the duration that the bearing can run without having to be relubricated.

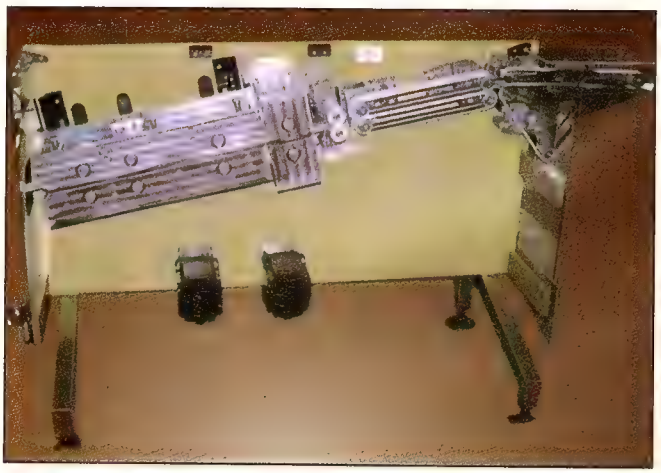
For short-stroke applications that typically cause shaft failure, Super Smart Ball Bushing bearings—coupled with 60 Case shafting—can increase shafting life up to 400%. **Circle 815**

Compact footprint: Baldor's full range of automation motors (servo, spindle, vector) and drives comes in a variety of frame sizes and torque capacities to fit into motion control systems where space may be a constraint.

aging systems being engineered for uptime, in features such as electronic push-button changeover, on-the-fly machine phasing, and automatic rephase/reset after machine jams.

Dan Throne, packaging branch manager for motion control supplier Indramat Div. of Mannesmann Rexroth Corp. (Hoffman Estates, IL), explains that by minimizing motion variations, precise control is redefining the practical speed limits of cartoners, wrappers, and form/fill/seal machinery. This precision takes the form of high-resolution (up to 2 million lines per revolution) encoder-position feedback, intelligent drives with 1,024-point camming resolution, and motion controllers capable of synchronizing 30 or more drives. "More and more OEMs are completely automating the changeover process to eliminate human error," he observes. "Servos placed on guide rails and conveyors make automatic adjustments with just one touch of an HMI screen. This provides tool-less changeover in just a few minutes and removes the element of error from the equation."

Supportability plus. For all that speed and precision, in some packaging operations servo performance may be overkill. How and when to make that determination? Mannlein observes that packagers have a stronger reliance upon systems integrators these days—to guide them through technology selection and provide equipment supportability. "They want to develop a partnership with an integrator who can be depended upon to know the correct level of technology



Continuous motion sheeter/folder from Automated Motion Inc. scores and fold cards as a platform for candy inside film wrap. The two-axis servo-driven machine can change card size on the fly and phase delivery into the candy wrapper, and it boosted throughput from 150 cards/minute to more than 600.

and apply it to their packaging automation needs."

Allen Presher, vice president of marketing for ORMEC (Rochester, NY), reports the majority of his customers for motion control systems use third-party systems integration. He sees large packagers working more with systems integrators and OEMs, as well as outsourcing a significant portion of equipment engineering tasks they previously performed in-house.

Sole sourcing is another route to ensuring long-term supportability, prompting OEMs to staff up in applications engineering, provide customer help lines, and continue strategic partnerships with key motor and motion control suppliers. A customer may perceive a Doboy high-speed box folder using motion control elements from Control Technology Corp. (Hopkinton, MA) as single sourced, based on the OEM's close cooperation with Control Tech engineers in terms of equipment support. "Long term electronic support is an important value-added service," states Doboy's Meer. "Our customers want us to assess all of the automation elements in their system for positioning, speed, and debottlenecking."

Thomson's Backman credits OEM/component supplier alliances with reducing hidden costs for customers, "such as compatibility issues (in connectors, software, and voltage levels), amortized research costs, and multiple-item shipping charges."

"Customers are seeking one source for responsibility, as well as one source for technology," agrees John Malinowski, drives specialist for Baldor Motors and Drives (Fort Smith, AK). That's one reason his company emphasizes training for its distributors and customers: several levels of coursework in drives, servos, and motion controllers, "to demystify what servos really deliver, which is accurate positioning."

According to Tom Schermerhorn, vice president of Control Tech's systems group, "the multi-tasking and multi-processing capability of our components, whatever the automation system, gives users the ability to divide and conquer with easily configurable electronic tools that break machine functions into modular form. This concept results in a functioning machine on a quicker time line."

He notes a trend in machine design from his own experience: the migration of

VENDOR-SUPPLIED COMPANY PROFILE

Standard servos integrate easily

Whether its boxes or bags, packaging machines have to handle large volumes of products with few adjustments and downtime. Linear and rotary direct-drive motors are providing new solutions to traditional assemblies for many applications in the packaging industry. Direct-drive motors integrate directly into a machine to improve performance and simplify design. These high performance, brushless motors provide precise movements, high speeds, and flexibility.

Kollmorgen's PLATINUM™ DDL (Direct Drive Linear) motors are an example of how linear motors have evolved from customer-specific designs into standard models that are reliable and easy to integrate into a machine. John Floresta, director of engineering at Kollmorgen, says, "The demand for linear motors has required these motors to become standard, general-purpose devices that are less costly, have the highest possible performance, and are easier to implement, both mechanically and electronically."

Kollmorgen also offers RBE Series brushless, direct-drive rotary motors which provide precise and smooth operation in a compact package. Rare-earth magnets help achieve very high continuous and peak torque ratings.

"A flexible product line is the foundation that allows us to offer our customer the best solution," states Larry Kingsley, Kollmorgen's executive vice president of Sales and Marketing. "We design and modify products in specific form for what the customer needs, which augments our ability to sell a broad line of standard servo products. We prefer it when customers come to us and say we like this motor, but can you change this." Kollmorgen makes minor engineering modifications all the way to the custom motor developed from scratch.

To tie its different motors types together, Kollmorgen provides a universal amplifier platform. SERVOSTAR™ digital amplifiers can run rotary, linear, and direct-drive motors. "Ultimately, the customer gets better machine performance," states Carroll Wontrop, Kollmorgen's senior product manager, "because he does not have to run different amplifiers and deal with separate suppliers." Circle 818

core technology developed for customized applications into standard equipment features. This extends an OEM's development dollars and benefits end users with option-rich machines. An example of such technology within Control Tech's products is Soft PLS (programmable limit switch), a feature that selectively controls up to 16 high-speed outputs within one or two axes of motion. "Close integration of functions is necessary in today's applications," Schermerhorn asserts, "especially where speeds have increased and swift changeover is crucial to a project's success."

Get on the bus. The clearest trend in packaging operations is factory/machine networking, whether in a single plant (intranet) or with other plant locations. This is possible through the "open" architecture of third-party network protocols such as Quantum Ethernet, Transmission Control Protocol/Internet Protocol (TCP/IP), Profibus, Modbus, Interbus, and DeviceNet. In addition, SErial Realtime COmmunication System (SERCOS) provides a digital interface standard for communication between digital drives and controls. Implemented over a noise-immune fiber-optic ring, it reduces wiring costs and provides vastly more diagnostic information than analog interfaces. All Indramat controllers offer SERCOS linkage.

Controller hardware incorporates

Doboy Div. of SIG Pack Inc. built its first totally electronic (motors) horizontal wrapper in 1984 (7 servos). The Stratus machine shown features 20 preprogrammed set ups for applying film pillow pack, then cutting and sealing at up to 75 packages/minute. Servos drive in-feed conveyor, cutter/end sealer, and film/drive sealer axes.

The Simple Solution For Complex Systems

1-800-77 SERVO
or 1-540-639-2495
Fax:
540-731-0847
Internet:
http://www.kollmorgen.com

KOLLMORGEN

SERVOSTAR™
Family of Digital Amplifiers

Circle 818

VENDOR-SUPPLIED COMPANY PROFILE

Two build motion control menu

In 1983, Jacob Tal, former professor in the Electrical Engineering Dept. at the University of Utah, and Wayne Baron, an engineer at Hewlett-Packard, invested their personal savings and co-founded Galil Motin Control—a company that develops and manufactures high-performance motion controllers.

After drawing no salaries and reinvesting everything back into the business, Jacob and Wayne grew Galil into a company boasting more than $25 million in sales and fifty consecutive quarters of profit. Galil is located in the heart of Silicon Valley in Mountain View, CA with more than 25,000 sq ft of manufacturing space.

Knowing that these motion control products would be useful in the OEM marketplace, Tal and Baron began investing the time needed to educate engineers about this new technology. They provided motion control seminars to instruct engineers and allow them to see the possibilities of what a motion controller could do in their own design environment. More than 10,000 engineers attended the seminars.

Today, more than 200,000 controllers are at work in various industries such as packaging, machine tooling, manufacturing, medical equipment, aerospace, materials handling, semiconductor manufacturing and testing, and test and measurement equipment.

Galil's motion controllers cover application requirements, whether simple point-to-point positioning or complex coordinated motion among multiple axes is needed. The motion controllers include the DMC-2000 Universal Serial Bus (USB) standalone controller with 1 to 8 axes; the DMC-1700 ISA Bus Series with 1 to 8 axes; the DMC-1600 Compact PCI Bus Series with 1 to 4 axes; the DMC-1500 standalone RS232 Series with 1 to 8 axes; and the DMC-1000 ISA Bus Series with 1 to 8 axes.

Accessories are available for customizing a controller to meet specific application requirements. They include software design tools for quick and easy set-up, tuning, and analysis; servo amplifiers; motors; and encoders. Circle 820

communication ports to access these protocols, which can be configured on different platforms or buses: field bus, device bus, and sensor bus. Through this open bus architecture, diagnostic, maintenance, and product-analysis data can be collected and compared globally on a system-wide basis, to optimize that bottom-line performance variable, throughput.

"Open architecture gives customers the highest level of flexibility for integration of motion control elements," says ORMEC's Presher, who believes that if motion is at the heart of a single packaging machine, then connectivity is the heart of machine systems. Christopher Englert, technical marketing specialist at ORMEC, adds that one of the recent benefits of open connectivity is the ability to synchronize axes in groups or control them independently. This ties flexibility back to improved efficiency and throughput.

Equipment OEMs are already working on integration of the WorldWide Web into machine operations. There's also a migration toward centralized PC control of automation systems that would eventually outdate the PLC and separate motion controllers. PCs are considered easier to program and configure (especially for advanced high-speed motion control), and are available at lower cost. There is less consensus on whether PCs currently have sufficient computing power for the complex algorithms that machine/motion controllers must process. Some suppliers caution there's more work to do with PCs in protecting volatile data from power fluxes, and see the value in motor-embedded CPUs to assist with meeting high-speed servo-loop closure rates. Still, Doboy's Kelly Meer told *Design News*, "This move toward PC control is not a fad, but a real trend."

Packaging/labeling Operations: Two for the Speed of One

Specializing in product identification solutions, JET Equipment (Santa Ana, CA) took on the challenge of a medical packager to integrate a gantry-mounted, multiple-print-head marking machine with the packager's existing form/fill/sealer machine.

Besides accomplishing ANSI grade "C" bar code marking of Code 128 HIBIC on a porous film surface, the systems' integrator/machine builder had to handle another essential constraint: make a machine that could mark up to 16 different codes simultaneously and do so within the existing 12-second cycle time.

"It's almost like the bar coding is free," says Derrick Ford, president of JET Equipment. "Marking could not be the bottleneck in this packaging operation. The WMS web marking machine we designed gave the packager two operations—marking and packaging—within the speed of one."

Ford credits a large part of this project's success to the servo motors, drives, and TMC 2000 controller supplied by Thomson Motion Control Div. Thomson also provided engineering support to configure the 43-inch long by 36-inch wide, two-axis gantry. "The X-Y gantry has to swing up 45 degrees to allow an operator access to the form/fill/sealer," explains Ford. "Thomson helped us engineer a hinged gantry platform with gas springs. Servo interlocks perform the safety feature of blocking printing, except when the gantry is in the correct or DOWN position." Further, the motion controller hardware allows a specific output to be fired on each print head while gantry travel is occurring.

He adds that "this was the first time anyone built a motion control platform for us. Thomson's reponse time was amazing—within four weeks, even after we required a gantry extension for a longer package size." Key to the gantry's design was rigidity (to maintain accurate high-speed marking) without what Ford calls "industrial bulk". "The form/fill/sealer machine has an elegant design and we wanted the gantry to follow that style," he says. Thomson's engineering made the match.

To program the WMS marking machine and gantry, JET supplied the packager with its proprietary and trademarked IMS Windows-based software. Though Ford will not reveal the exact acceleration/deceleration speeds of the four-print-head gantry, he did say this application runs up to 8,000 ft of film in bar-coded and sealed packages within an 8-hour shift. Closed-loop servos were required to achieve repeatability and marking accuracy to within ±0.05 inch. Since these package sizes vary from 3 x 2 inches to 1 x 17 inches, changeover is automated on-the-fly via a touch screen from Data Lux (San Jose, CA). Ford reports expanding I/O capability through a hardware card, primarily to trigger alarm and status lights, sense limit switches, and activate the safety servo interlocks. He also states that WMS web marking machines with Thomson motion control elements and Videojet (Wood Dale, IL) ink-jet printers have become standard equipment available from his company.

In 1987, Galil introduced the first 3-axis motion controller to perform coordinated motion along 2-D paths.

TODAY WE MOVE THE WORLD

Precisely

Today, Galil continues to be the standard bearer for motion control solutions in equipment used to manufacture such intricate devices as semiconductors and printed circuit boards. Accurately. Dependably. Affordably. That's the focus of the world's most complete line of high-performance motion controllers for steppers and servo motors. Our advanced controllers can position loads with an accuracy of .1 micron or better. At a stunning 62.5 microseconds per axis servo update rate. Along with high speed binary command processing and a DMA communications channel for instant data access. Let the value in Galil controllers move you, too.

CALL 1-800-377-6329 TODAY

FOR YOUR FREE PRODUCT GUIDE, INCLUDING A TECHNICAL REFERENCE ON MOTION CONTROL.

Visit us at www.galilmc.com

GALIL

©1998 Galil Motion Control, Inc • 203 Ravendale Drive • Mountain View, CA 94043
800-377-6329 • 650-967-1700 • Fax: 650-967-1751 • Email: galil@galilmc.com

Look for Galil at SEMICON West 98, Booth #9110

Circle 820

VENDOR-SUPPLIED COMPANY PROFILE

Engineers package quality

The Torrington Co., founded in 1866, is today one of the world's leading producers of precision bearings, motion control components, and assemblies.

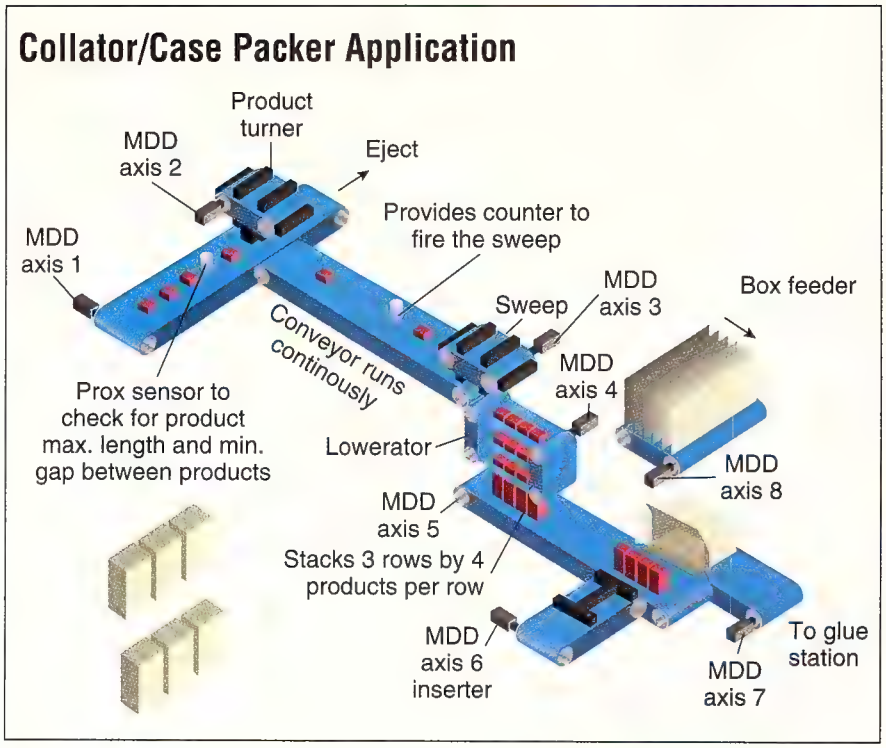
Some of the company's advanced products include TORRINGTON® needle roller and heavy-duty roller bearings, FAFNIR® ball bearings and housed units, and KILIAN® precision-machined ball bearings. Sizes for these products range from a tiny 1/8-inch bore up to 14 ft outside diameter. Torrington's products serve world industries including transportation; metal and paper mills; aerospace; industrial machinery; machine tools; defense; consumer products; and electronic and communication equipment.

Continued innovation. Torrington manufactured its first bearing more than 80 years ago. Significant product innovation dates from the early 1930s, when the company originated the drawn-cup needle roller bearing, the outer ring of which is press-formed from strip steel rather than machined. Other technical breakthroughs include the needle roller thrust bearing, drawn-cup roller clutch, wide-inner-ring bearing with eccentric locking collar, aircraft control bearings, a screwdown roller thrust bearing for metal rolling mills, and an assembled camshaft.

Expert technical support. Torrington engineers possess the technical expertise to solve critical design challenges. They can also provide valuable development assistance and help customers enhance the performance of equipment systems. Regional marketing centers and sales offices in strategic cities offer continuous support.

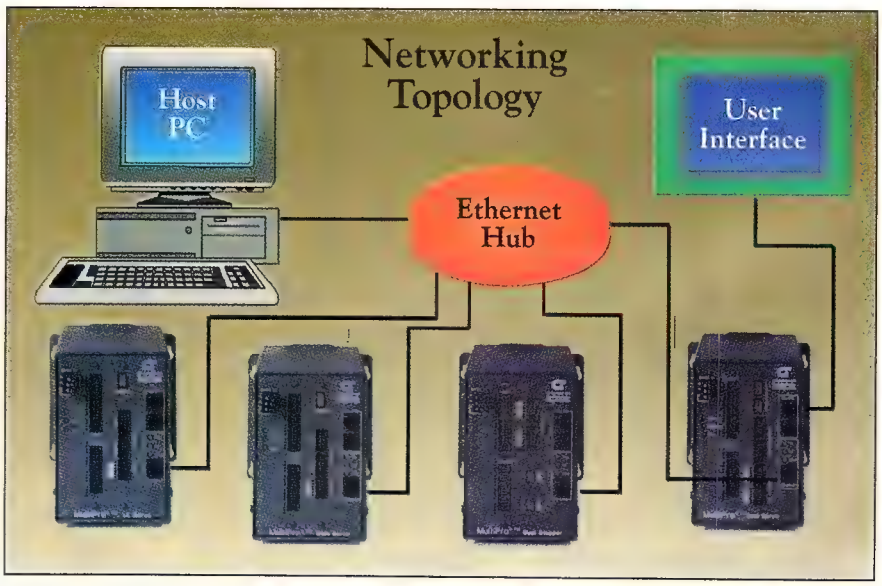
Worldwide presence. A subsidiary of Ingersoll-Rand, Torrington operates an extensive network of technical centers and manufacturing plants. More than 12,000 employees work in locations in North and South America, Europe, and Asia.

Quality and service leader. Torrington products continue to set the standard for quality and reliability, earning top honors and certified status. The company's operations have earned QS-9000 and ISO 9000 certification. A logistics network supplies worldwide bearing needs, and authorized distributors serve local aftermarket requirements.



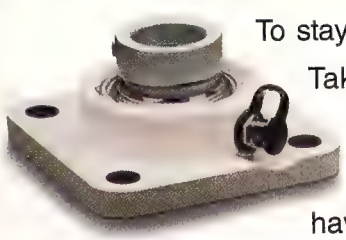
Integration of multi-axis servo-driven motion control into collator/cartoner operations shows the versatility of Indramat components and controller communication through SERCOS linkage.

Packaging machine design continues to incorporate leading-edge electronics that address customer directives for line efficiency improvements—within reason. Doboy's Meer concludes "maybe we can never make machines fast enough to deliver guaranteed efficiency numbers, but we are engineering clear advantages of precision, flexibility, supportability, and safety into integrated packaging, motion, and automation systems."



Global connectivity: the broader potential of networked automation elements is shown by Control Technology Corp.'s topology example, which includes MultiPro motion controllers engineered to integrate with HMIs, PCs, and network protocols such as Ethernet.

Fafnir can supply 100% of your daily requirements.



To stay strong, you need multiple bearings. Fafnir pillow blocks. Four bolt flanges. Take-up units. Kilian cam followers. You name it. But that doesn't mean you need multiple suppliers. At Torrington, you can get every kind of bearing you need to keep you up and running – without any running around. We have the broadest line of bearings in the material handling industry, all under one roof. For convenience, quality and breadth of product, there's no healthier choice.

TORRINGTON
INGERSOLL-RAND
Progress Through Performance

www.torrington.com

Servos add brains to PACKAGING MACHINERY

Through-put, reproduceability, maintenance, flexibility, and even safety improve

Alice Lium,
Contributing Editor

There is consensus among observers and participants that the packaging industry is increasing its use of servo systems—some see it as "exploding," while others just say it is "spreading and spreading." Small wonder. Servo systems can improve productivity and safety, and decrease costs. But packaging has been slower than automotive and robotics in adopting servos. Why? The machine tool industry embraced them in the '60s and '70s and automotive industries and robotics shortly thereafter. What's taking packaging so long?

George Glulalo, president of marketing consultants Motion Tech Trends (Inglewood, CA), has been looking at the motion control industry for more than a decade. He notes that packaging companies usually do not order machines in large quantities, and their development time is long, so the industry does not change very fast. Now, though, "almost all packaging machine producers' lines have servos," notes George Kaufman, CEO of Automation Intelligence (Duluth, GA), a motion control software company that integrates the functions of servo systems. They may handle only a single high-end servo machine, while their low-end line is still mechanical. But their

Topper Hartness of Hartness International points out how the servo drives (lower grey cases with red label) are separated from the PLC (upper grey case) for easy maintenance and troubleshooting on this servo system decaser. (Photo courtesy of Hartness International)

■ VENDOR-SUPPLIED COMPANY PROFILE

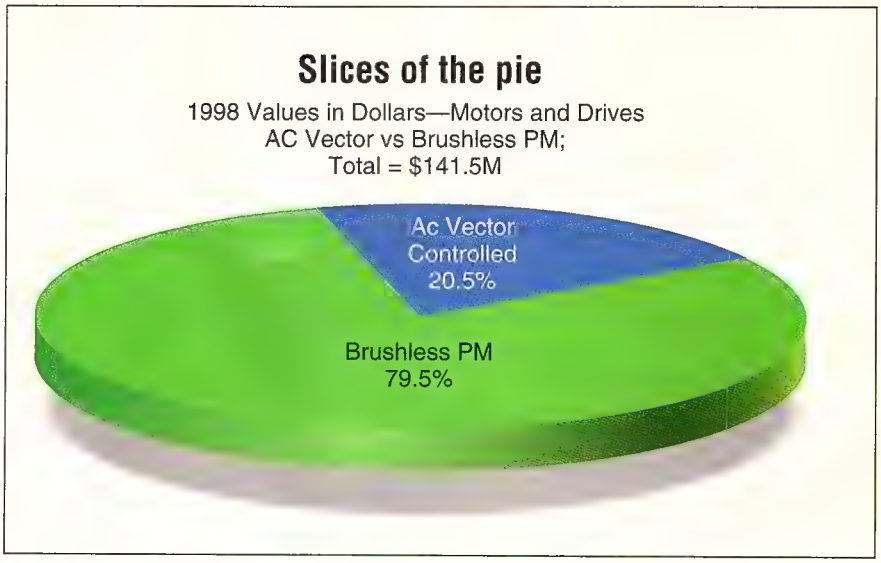
CAM design on-the-fly

DSP Control Group Inc. (DSPCG) recently announced the release of Mx4 Octavia, a 3D motion controller that combines the power of a PLC, motion controller, and floating-point computer for use in packaging and other general-purpose automation applications. The controller's hardware architecture is parallel DSP hyper cube with 160-MHz clock frequency. Mx4 also performs drive functions such as sinusoidal commutation, digital current loop, and vector control for industrial motors on the same pc board. The controller maintains a 10-ms loop update rate regardless of the number of programs, algorithms, or other features included in an application program.

During the past decade, DSPCG has witnessed the automation of more than a hundred packaging applications such as bottling, synchronous and asynchronous cutting, fastening, and labeling. No motion controller has adequately addressed the needs of high-speed master/slave synchronization without designing its own CAM function on-the-fly. Now, the computation power of Mx4 Octavia makes this possible.

Tight master/slave motion applications require special hardware and control algorithms. The hardware must be highly responsive to external events such as the sensed marker position (by an electronic eye) in packaging, force (by a tactile force transducer) in robotics, or surface position (by a position probe) in machine tool applications. In tightly coordinated packaging systems, the control algorithm is responsible for tight operation of each position loop and tight operation of multiple motors. In simple words, what matters is that not only one motor is responsive to a command but that, in conjunction with the master, the resulting vector move is high bandwidth.

For the past ten years, DSPCG has served the military, machine tool, semiconductor handling, packaging, automotive, printing, paper processing, web tension control, and other general automation markets. All DSPCG products include parallel processing at very high clock frequencies. Also, these products come with the option of performing commutation and drive interface on the card. Circle 822



application of servos to their line is moving down.

Bryan McGovern, marketing manager for Emerson Motion Control (Chanhassen, MN), notes the pattern of servo-use change. "We might have had one or two customers [at the Packaging Machine Manufacturing Institute show] about ten years ago. Eight years ago we had 30, then six years ago we had 70, and this next time our company will have worked with more than about 130 OEM servo customers."

Servo use is growing because of striking improvements in intelligence technology over the past decade. Servos can do so much more than they could before: Servo systems are an order of magnitude more flexible than mechanical systems, they can be programmed to successfully perform the same complex maneuver whenever its recipe is called up, they increase manufacturing through-put, drop maintenance costs, and can increase safety. Microprocessor and software development make plug-and-play common. Nevertheless, the big issue may be education. Some companies and their machine designers have only recently seen how to make servos work for them.

Everything but the Swiss army knife. An example might best illustrate what they are seeing:

National Instrument Co. (Austin, TX) designs packaging machines that handle pharmaceutical and personal-care products. One of their products is a rotary capper, which places, starts, and tightens caps on bottles or jars. The old system used a slip clutch, which could be adjusted to screw the cap to the proper tightness by applying a specific torque to turn the chuck containing the cap. If the cap jammed or the threads did not engage properly, the slip clutch would achieve its designated torque, notice no problem, and the container would continue on down the line. Assuring that the bottles had been properly capped required that they be inspected and sampled after the process.

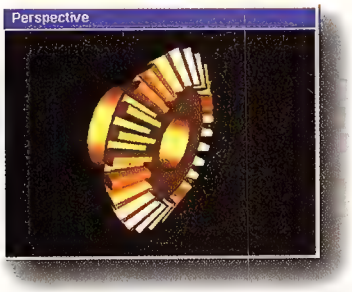
The servo-based capper is programmed to turn the cap a predetermined number of revolutions until a certain torque is achieved, then hold it for a specified time. A jammed or mis-threaded cap wouldn't revolve the proper number of times. A broken one would turn too many times and without the proper torque. In addition, to check the caps, the machine can apply a small reverse torque, loosening the cap only if something is wrong. In the event of any of these errors, the machine notes the discrepancy and immediately reports the malfunction.

With the old system, when the machine was to be changed over to a different bottle and cap, a technician had to unbolt mechanical components, adjust the torque on the slip clutch, then trial run the machine. An overtorqued container, for instance, would put a cap on too tightly to be opened by hand, frustrating the end user's customers. Even with the best of charts and values, a technician would have to readjust the gears, test them, tweak them, and generally consume perhaps half a day.

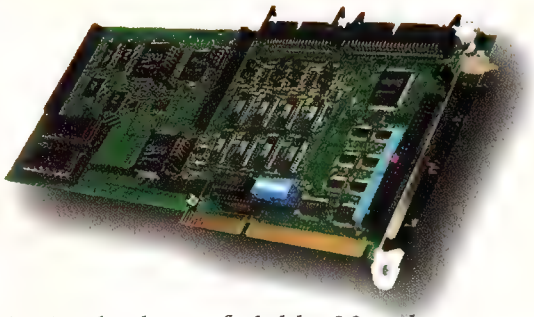
Under the servo system, the machine digitally stores exact infor-

The World's Fastest 3D Motion Controller

Mx4 combines the power of a motion controller for 1 to 8 motors, PLC and on-board programming with floating point math -- all on a single-slot PC board.



Mx4 is the world's first open motion controller that interfaces directly to 3D NURBS surfaces.



Non-uniform rational b-spline is the state-of-the art in CAM graphics. Mx4 interfaces to 3-D NURBS curves directly; therefore curves need no post processing before being transmitted to the Mx4. The result is a 30% increase in part manufacturing speed with increased accuracy.

NURBS

Performance

Digital Amplifier

Flexibility

Mx4 technology is fueled by 80 and 160 MHz parallel DSP processing, 64-bit floating point math, 100 ns position capture, 10 µs servo loop update rate, and 5000 blocks for block transfer rate.

Mx4 interfaces to any digital pwm amplifier (dumb drive). The Mx4 controls brushtype DC, brushless DC, AC induction or stepper motors. Any combination of the above industrial motors is software configurable.

And yes - Mx4 features DLLs and DDEs on Windows 95 and NT for Visual Basic, C and C++. In addition, the development tools include signal generator, live oscilloscopes and a frequency analyzer on those platforms.

Mx4 digital current loop enhances servo stiffness and speed regulation. Mx4 software configures its drive to all industrial motors.

DSPCG

Serving the industrial and military markets for 10 years

www.dspcg.com

DSP Control Group, Inc. 4445 W 77th St. Minneapolis, MN 55435 tel: (612) 831-9556 FAX: (612) 831-4697 email: info@dspcg.com

Circle 822

VENDOR-SUPPLIED CASE HISTORY

Drives help replace mechanics

Pacific Scientific has established an excellent reputation throughout the packaging industry for providing electronic motion control solutions. It's industry experience includes motion control solutions for all forms of material handling and packaging equipment. As industry demands more from every piece of equipment; speed, accuracy, and flexibility are becoming increasingly critical.

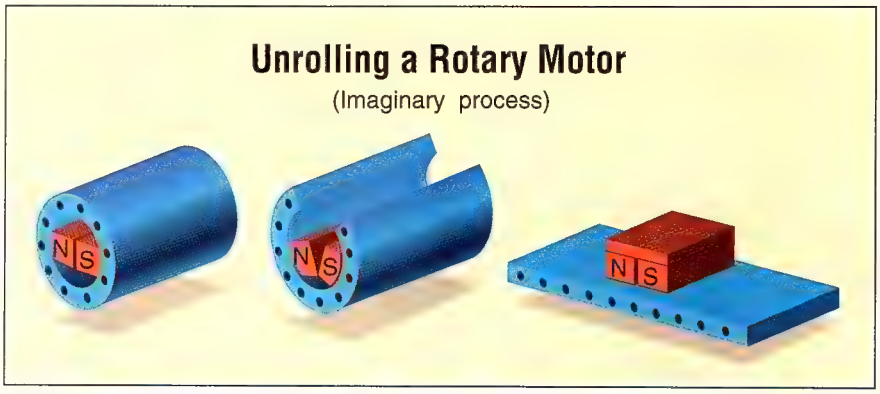
To address this trend, Pacific Scientific customer Cloud Corp., a producer of high-speed continuous-motion pouching equipment, developed the FlexWorks™ system of modular pouching components. The system is designed to quickly handle complete product line changes. Cloud Corp. uses the electronic gearing functions of Pacific Scientific's SC900 digital servo drives with its Advanced Motion Language (AML) multi-axis motion control software to replace a complicated mechanical line-shaft arrangement.

A Pacific Scientific MC-800 motion controller uses AML software to control multiple axes of servo motion. SC900 digital servo drives in several power levels drive SENTRY and REGAL servomotors. The drives communicate with the motion controller using a SERCOS noise-immune fiber optic network via an OC940 plug-in option card.

The new FlexWorks system uses a series of servo-driven modules, so a machine can be assembled to run any number of pouch types. The individual modules can then be uncoupled and wheeled away for product change and washdown. Simple connectors and latches allow quick changeovers of FlexWorks components.

The modular approach of the SC900 drives allows the design engineer to mix and match components to precisely tailor the system to specified parameters. The drives and motors are selected based on the torque, acceleration, and inertia necessary to optimize the operation of a machine.

Pacific Scientific's products are designed and built to maximize performance—guaranteeing that users benefit from the latest in high-speed and precise positioning in servo and stepper technology. Pacific Scientific also conforms to ISO9001 manufacturing procedures. Circle 823



A linear motor is like a rotary motor whose stator and rotor have been cut along a radial plane and unrolled so that it provides linear force. A rotary motor can produce linear motion with a lead screw or a ball screw, and it is adequate for most cases. The linear servo motor tends to cost more, but because the motor itself is pushed back and forth, its path is a particularly stiff and smooth direct linear motion, with no gears or screws to create any backlash. Both Kollmorgen and Baldor integrate linear servo motors with rotary motors in some machines. (Drawing courtesy of SERCOS website)

mation on positioning servos, number of turns of the chuck, and torque levels. "When you have to govern the amount of force on anything, it helps to have it digitized," notes Jack Chopper, electrical engineer for National Instrument. The operator needs only to select the recipe for the current production run on his/her screen, run a couple of samples, and be ready to go in a few minutes.

"What we're doing with this machine could not be done mechanically, comments Chopper. "You could do something similar, but not in this floor space with all of the features that we have."

In addition, these servos are reliable. New designs generally incorporate solid-state, brushless servo motors with no wearing parts, no brushes to change. When the brushless servo motors fail, it's usually the bearings at fault.

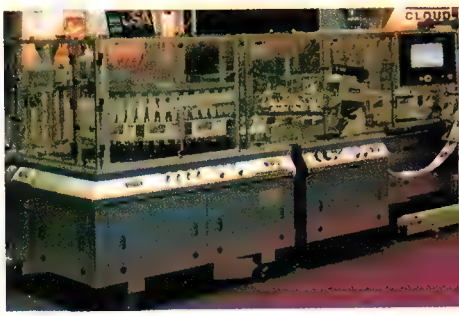
Diagnosis and maintenance of the servos is generally simpler than on the mechanical systems, too. In clean rooms, it's an especially big issue. A technician can't just come in with a conventional toolbox; they have to go through a special procedure, explains Jack Grosskopf, National's director of engineering. So, if a technician brings in the wrong wrench, and goes back to get another one, then that one has to be cleaned. "Making the adjustment is not very user friendly," he says.

On servo systems, Michael Backman, motion control division manager from Thomson Industries (Port Washington, NY), notes, "Many of the hand-held tools that you would use in the past are now in software. We have multichannel oscilloscopes and voltmeters in the software. We are able, because of the nature of the digital drive, to take a measurement of any important voltage, current, or power level on the drive and display it on the screen in either a graphical or a tabulated form. I don't know that there's any tool that you need to work on our drives that's not in the software—aside from a screwdriver to install it."

A decade for changes. The servo system outline has remained fairly stable during all the changes that made sophisticated automation possible. There is a servo motor for each machine axis (where, say, a piston moves up and down or a rotary chuck drive rotates). The servo motor responds to the pulse information from its drive, and then returns feedback about location, speed, and torque. All the drives in the system then receive commands and send feedback to a controller computer that has been programmed for the specific task—such as filling and then sealing different sized pouches. (The older term for a servo motor drive was "amplifier," because it took the weak signal from the controller, and amplified it into the large power shifts necessary to control the motor. As amplifiers have gained more intelligence, the term "drive" has become more common.)

Squish Zip Whoosh

Packaging Motion Control Solution



Your motion defines your machine.

No one realizes that more than Pacific Scientific. We offer motion solutions for the packaging industry--from motion controllers and software to high performance motors and drives, for powerful Zip and precise Whoosh. Our broad range of technologies --servo, stepper and PMDC--can be customized to fit your unique applications. Reliable products and responsive support assure your peace of mind. Even if your machine goes "KACHUNK, SNIP, Wheee."

The FlexWorks™ modular, high-speed, continuous-motion pouching system, from Cloud Corporation, uses Pacific Scientific high performance motion control products to replace a complicated mechanical line shaft system, making possible quick product changeovers and more flexible choices in web materials.

Call us! For more help on your application or for more information.

Call **888-4PACSCI**
(888-472-2724)

PACIFIC SCIENTIFIC
HIGH PERFORMANCE MOTORS & DRIVES

www.pacsci.com/packaging

Circle 823

VENDOR-SUPPLIED CASE HISTORY

Robot achieves perfect axis coordination

Hershey Chocolate North America packages up to 200 units/min with a parallelogram robot/cartoner. One Indramat CLC multi-axis plug-in control card precisely synchronizes five axes—the infeed speed and spacing of wrapped candy, and all actions of the robot's three-stage product accumulator.

The robot also uses two digital servos for positioning, and one for the robot hand which tracks the continuously moving cartoner discharge belt to assure that product placement matches belt speed.

Using the SERCOS (IEC 61491) digital communications standard, Indramat's open-architecture control system coordinates multiple, single-axis motions at the collator with complex, kinematics robotic motion.

Digital motion controls allow robotic insertion of fragile products, such as cookies and crackers, into trays without breaking. Standards-based digital control facilitates rapid changeover—for example, in only five minutes Hershey can switch a line from wrapping single-cup packages of Reese's® Crunchy Cookie Cups® to multi-cup packages. The Windows-based motion application allows graphical parameter changes at the HMI such as new end-product length, style, pattern, and size. A single Indramat CLC control can handle up to 32 axes, reducing hardware and related capital costs compared to rack-type motion controllers and also increasing throughput.

Electronic registration simulates the functions of a backlash-free gearbox, and continuously adjusts positioning between the master axis and the digital drives to compensate for minute positional errors.

Electronic camming reduces setup times and product changeovers from hours to minutes. Resolutions as high as 1,024 points/revolution assure smooth cam actions for high-speed, jam-free product feeds.

The servos provide superior stiffness, and eliminate the disturbances and vibration typically induced by conventional mechanical line shafts. Circle 824

There have been some improvements in the servo motor itself—brushless motors are one—and Japanese and American technologies are offering some new, less-expensive designs. Dan D'Aquila, product marketing manager for Pacific Scientific (Wilmington, MA), says that his company had redesigned some motors using new magnetic material. But, Motion Tech's Glulalo reports, "The biggest changes in the industry are being spurred on by developments in software and silicon." In other words, the intelligence has grown by leaps and bounds. Automation Intelligence introduced its motion control software, AML, in 1992. CEO Kaufman says: "We were selling that with a 486, 25-MHz PC, and through no effort of our own, we're now applying our product on Pentium II-class PCs. It's probably a 50 to 100 times increase in performance of the hardware platform, with no changes in our software."

Jeff Pinegar, director of marketing, says, "What that's meant to our customers is they can control more axes. Before, maybe they could control six or eight axes for an application with the speeds they were trying to run at. Now they can control 12, 14, 16 axes."

Also, he asserts, "Five years ago the big PLC companies of the world were saying that PCs would never be on the factory floor because they were not reliable enough and didn't have the performance. PCs are now pervasive on the factory floor."

Merely having increased computer muscle is not enough to make servos popular, though. "Years ago," comments Sal Spada of Automation Research Corporation (ARC; Dedham, MA), "people sold a drive, a motor, and a controller. Well, what were you going to do with it? It was like having a computer and no software in it."

"A lot of people said 'Oh, I have to program this device, and I don't know how, therefore I'm leery of it,'" explains John Mazurkiewicz of Baldor (Fort Smith, AR). But things have changed. "In 75% of the cases now, there is a PLC or a device that contains the programming knowledge, and all you have to do is tap that device, put in the controlled motor, and you have upgraded to brushless technology."

Thus, OEMs increasingly are buying off-the-shelf motors, drives, and computers with specialized integrated circuits and software; then designing the machine to, say, fill and seal pouches. They program the software, test the machine, install it, then support and troubleshoot its use.

Emerson Motion Control, for instance, has created modules that the OEM can attach to the front of the drive. The modules take out all the programming, explains McGovern, so the operator simply answers a series of questions and the drive is ready to perform its complex task.

Manipulating intelligence. How this intelligence is deployed is a matter of some debate. The "one-brain" camp holds that it should be concentrated in a central computer, while the "distributed" camp would locate more intelligence in the drives. There seems to be no single answer, explains Glulalo, because the packaging industry includes so many applications. In any particular product, he notes, usually the location of the intelligence depends on the designing company's pedigree. Amplifier and motor-drive companies tend to make their drives more intelligent. Control-oriented companies tend to want to put more of the intelligence into the general-purpose controller.

AI's approach tends to be integrating the machine control into a central intelligence and distributing the motion control to smart drives over the digital network. Pinegar comments, "When we started, we used this PC only for motion control. Now the human-machine interface, maybe some soft logic, and more of the application go onto a single PC. That means less hardware, lower cost, and higher reliability."

Such integration is only possible with a digital system, and AI uses the SERCOS (SErial Real-time COmmunication System) open, international standard, fiber-optic, digital interface, which is especially good for high-speed coordinating of digital drives, I/O, and machine motion control. It allows the extra flexibility of plug-and-play between products and vendors.

Although sophisticated functionality is a reason to go integrated, some companies choose to avoid a system with a big brain. Hartness International (Greenville, SC) makes case packing machines, ones that load rigid containers into boxes.

"There are certainly a lot of reasons to use servos," says Topper Hartness, vice president of research and development, but integration isn't one of them.

engineering
mannesmann Rexroth

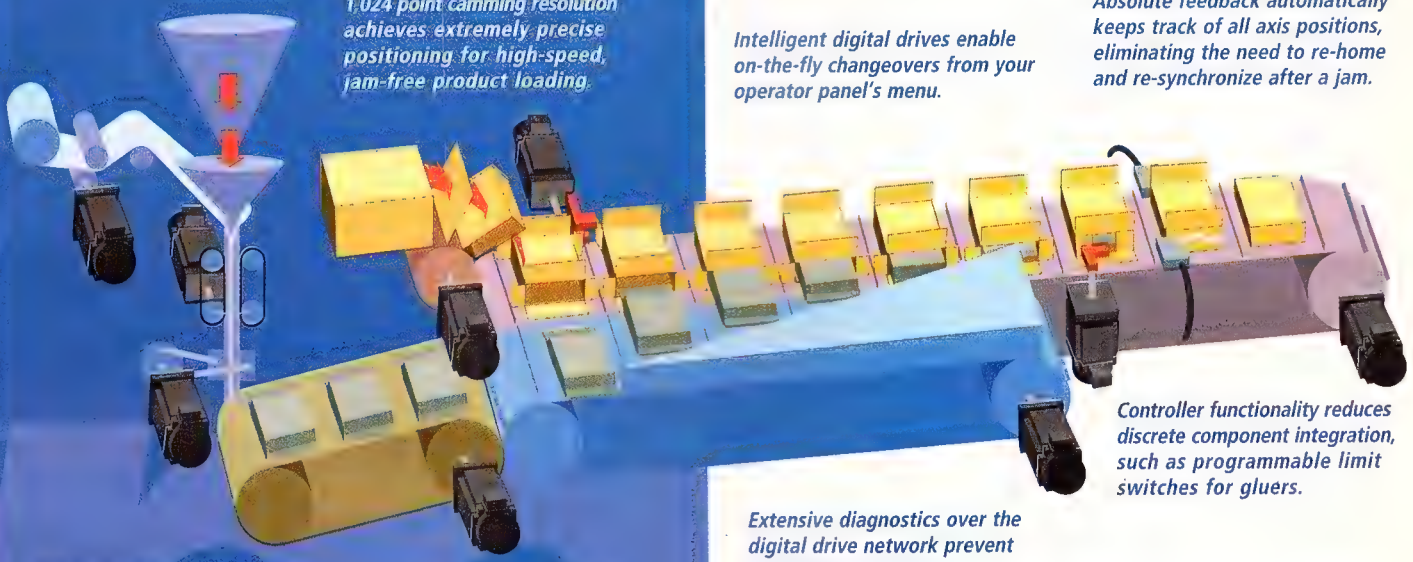
Fact:
Servo control makes packaging machinery faster, more reliable and flexible.

So where's your next big return on investment coming from?

1,024 point camming resolution achieves extremely precise positioning for high-speed, jam-free product loading.

Intelligent digital drives enable on-the-fly changeovers from your operator panel's menu.

Absolute feedback automatically keeps track of all axis positions, eliminating the need to re-home and re-synchronize after a jam.



Controller functionality reduces discrete component integration, such as programmable limit switches for gluers.

Extensive diagnostics over the digital drive network prevent unscheduled downtime.

No more racks full of motion controllers. A single card can handle 32 servo drives.

250 µsec drive position updates support higher machine speeds.

Control simultaneously communicates to drives at the speed of light. High-speed registration, tension control, electronic gearing are achieved with superior accuracy.

Your next big return on investment will come from an automation strategy that leverages software, hardware and communications standards.

A strategy that delivers increasingly precise and synchronized machine motion.

Indramat is doing all this today -- for some of the world's largest, most profitable packagers of food and beverages.

Our open architecture approach helps you reduce training, commissioning and manufacturing support costs. Our connectivity gives you timely access to production management information.

With Indramat servo performance, you'll overcome mechanical packaging line bottlenecks. You'll achieve a better balance between machine speeds. And you'll increase line throughputs without jamming or registration problems.

To learn more, get your copy of Control Systems for Automated Packaging Machinery.

Call 1 847 645 3600 or email us at packaging@indramat.com.

Indramat Division
Mannesmann Rexroth Corporation

5150 Prairie Stone Parkway
Hoffman Estates, IL 60192-3707
Tel: (847) 645-3600
Fax: (847) 645-6201
http://www.indramat.com

See us at
Pack Expo '98
Booth # N-4952

Indramat

Circle 824

VENDOR-SUPPLIED COMPANY PROFILE

Company offers single-source solutions

Watlow Electric Mfg. Co. designs and manufactures industrial heaters, sensors, controls, and software—all of the components of a thermal system. This provides the user with a single source for performance accountability. Designing and manufacturing all of the components of a thermal system allows Watlow to recommend, develop, and deliver the optimum thermal solution for customers' equipment and process heat requirements.

Watlow manufactures thermal systems for multiple industries including semiconductor, medical, packaging, foodservice, and plastics. It provides engineering expertise and customer service for developing a thermal solution that meets application specifications.

Watlow's committment to providing the best heat solutions continues through ongoing new product development. Its R&D facility is dedicated to long-term research to identify new technologies and develop thermal support components. In addition, Watlow houses more than a quarter of a million engineering designs on file so in many cases, they already have the design that users need.

Watlow produces heating system components in 11 manufacturing locations in the U.S. as well as six locations in Europe and Asia. the company has adopted ISO 9000 procedures as the quality standard throughout its facilities worldwide. Each Watlow plant is equipped with its own research and development department to constantly test new designs, construction methods, and materials. Customer R&D services also include prototype development and quality certifications.

Watlow offers its customers a variety of resources that make doing business simple and efficient. Some of the services offered include: same day shipment of various stock components when ordered by 5p.m., ship-to-stock and just-in-time delivery programs; fast prototyping; sales engineer support on custom design and made-to-order items, and a commitment to total quality and customer satisfaction. Circle 825

He's going for simplicity.

Hartness doesn't want you to even know that his is a servo machine when you stand beside it. He wants its parts to correspond to the old air-cylinder machines that his customers understand. The motor exactly corresponds to the air cylinder and the drive corresponds to the air valve. "When you close a set of contacts for the drive from your PLC, it's like spooling a valve on an air cylinder," he explains.

His system consists of a PLC, drives, and a PC. The PLC selects the recipe for the drives for a particular task. The intelligence—or the recipe—for the appropriate motor motion is stored in the drive. The PC only monitors operations and diagnoses problems. It has a modem so that his company can call up the PC and diagnose from home—even if the installation is in Saudia Arabia.

It's still incredibly adaptable. "Most of the equipment we make has to be flexible in order to run the variety of packages that you see in the food store," Hartness notes. With air cylinders, it was a complex, half-day tweaking battle to change from a 12- to a 16-oz ketchup bottle.

Pneumatics to servos

Topper Hartness, vice president of research and development at Hartness International, estimates that servo systems increase plant through-put without speeding up his case-packing machines.

Pneumatic machines pose some problems that servos address. "Air," Hartness notes, "is not very efficient." It leaks easily, and it is easily contaminated by water, which upsets the delicate timing.

For one thing, the pneumatic machines usually run at a higher pressure than necessary to perform their task. In the morning, when the grease in the plant is cold, more force is required to move them. In general, Hartness says, "the more pressure you run, the more consistent they are." Then the pneumatic machines can't be slowed down or sped up to meet line conditions, because the timing goes off.

Even once the cylinders are moving, they have a difficult velocity profile. "We need things to start off briskly, then stop at a controlled rate," he says. Air cylinders start off sluggishly, and by the time they get to the other end, they are at the top of their acceleration and stop only by hitting some sort of shock absorber. That produces what Hartness calls "click-click, bang-bang."

Air isn't very accurate, either. To move production along briskly, action B may need to start before action A is finished—to "lead" it. Air doesn't lead well.

Servo systems provide an effective answer. First, the electric motors are more efficient than air. "At one of our machines in a typical place in the North, you may be talking about $10,000 to $15,000 a year in energy savings," says Hartness. Then, the drives are programmed so their motors completely control the acceleration. "It may be 1/4G, 2 Gs, but we never let it get out of hand. So what we end up with is about 25% more cycles per minute, with less feet per minute, which means we have a lot less wear and tear on the machine. We can slow a servo system down when the customer needs less production. We end up cutting down the acceleration rate and particularly the deceleration rate, which means that it's far superior in shock, shake, and stress."

Change-over is vastly simplified, too. Instead of shifting mechanical components and adjusting for hours, the operator simply indicates on his/her computer screen which production run is appropriate—and is ready to go.

Maintenance is even simpler. The diagnostic computer indicates what is wrong: a motor, for example, or a drive. If it is a drive, "all you have to do is follow a simple set of directions: unplug all the plugs, take out three screws, set in the new drive, put the three screws back, plug in the plugs, put in the memory chip, turn it on," Hartness explains. It's similar for a motor.

The servos can be made a lot safer, too. An air cylinder, explains Hartness, either wants to be at the beginning of the stroke, or it has pressure behind it to move it to the end of the stroke. For example, if a bottle jams in the machinery, it may stop a stroke half way. If an operator pulls out the bottle, the cylinder can snap to the end of its stroke, catching and injuring him. If, for safety, he dumps the air pressure, the unpressurized cylinder may cause other problems, especially if it falls or discharges other forces that have been stored before the jam. And before the system will stop, the extra energy from running at high levels must be used up—on a bottle, or a mangled box.

Hartness's servo system continually tunes itself so that a small excess force is all that is necessary to trip to system. "We have a machine right now that has a 2 1/2-hp motor that raises and lowers the case. Before the machine is trained, I can put my 200 lbs on it and go up and down with the boxes, and it doesn't know that I'm there," Hartness says. "After the machine trains itself, I can stop it with two fingers."

THERE ARE NO HEATING PROBLEMS, ONLY HEATING SOLUTIONS.

At Watlow, our core business is developing innovative ways to apply our heater, sensor and control technologies for improving our customer's products and processes. No matter what the challenge, our engineers can do the same for you.

Want proof? Subscribe to *WATTS CURRENT*™, our quarterly newsletter, to keep up with more innovative solutions from Watlow. Call today: 1-800-WATLOW2 (1-800-928-5692).

WATLOW
www.watlow.com

Circle 825

■ VENDOR-SUPPLIED CASE HISTORY

Gear drives spur growth

For more than 60 years the Stober brand name has been synonymous with gear-drive value. Stober ComTrac™ adjustable-speed traction drivers, MGS™ (Modular Gear System) speed reducers and gearmotors, and ServoFit™ precision planetary gearheads are just a few of the products that contribute to this reasoning.

Decades of application support, advanced gear technology, and a worldwide customer support strategy have positioned Stober Anteibstechnik as a world leader in providing gearing-technology solutions. Stober was founded in 1934 in Pforzheim, Germany, which is located 100 miles south of Frankfurt and is famous for jewelry and watch making. The company was first known for general machine building and motorcycle repair.

In 1943 Stober designed, developed, and manufactured its first mechanical variable-speed drive. The company introduced its worm gearmotor line in 1969 and its helical in-line gearmotors in 1982. During those years Stober began to expand into the areas of dc motors and controls, and frequency-regulated and servomotor drives.

The introduction of MGS speed reducers and gearmotors in 1989 helped move Stober toward its global strategy, which was enhanced in 1991 when Stober Drives Inc., located in Maysville, KY, became the company's official North American headquarters.

Stober's ServoFil line of precision planetary gearheads features Heli-Camber™ gear technology, based on advanced gear profile geometry, which significantly reduces backlash, gear noise, and wear while providing higher torque capabilities.

In addition, all of the units planet gears are hardened and ground to eliminate any irregularities that may generate pulsations in the drive train, which can in turn lead to speed fluctuations.

Applications include robotics, plastic molding, and machine tools. Stober products are available worldwide—in the Americas, Europe, Asia, and Australia. Circle 826

With the servo system, the operator triggers a particular loading procedure by indicating "16-oz ketchup" on his screen, and the PLC communicates "Recipe for 16-oz ketchup!" to the drives, and they shift their servos to the proper place, speed, torque, and pattern.

That called-up recipe for ketchup bottles is simple to train into the machine. The operator inserts a key into his machine and puts it in "learn mode." Then, using a joystick, he loads, say, three-inch bottles, six by six to a case, indicating 18 plus inches on a side. Then he raises the elevator to its maximum, so that the machine now knows the x and y dimensions. The computer whirs out the other 80 or so parameters and ripples them appropriately throughout the drives of the servo motors.

"I won't say it's as simple as air cylinders, and I won't say that people still don't blame it first because they don't understand it, but generally speaking, our systems have been extremely reliable, and we've had a very smooth transition," Hartness says. "We've got something that really performs and Pacific Scientific gave us enough intelligence that we can make it appear simple even though it isn't." And his customers don't need to know anything about servos or computers to use it.

Hartness may exemplify a trend. "That is a direct replacement," notes Sal Spada of ARC. "A lot of companies have introduced direct replacements of hydraulics with electronics, so the latest releases are mostly very simple, intelligent boxes versus complex, multi-axis, control systems. I've only seen one product come out in that complex domain."

The future beckons. What of the future? Packaging is an enormously diverse industry. In turn, the diversity of servo systems seems assured. Companies like AI are planning systems where the central intelligence does more and more. Several observers noted that for some 10 to 20% of packaging machines, accuracy and speed are less important and mechanics are appropriate, so probably they will remain mechanical. Packaging machine engineering is going forward to develop ever more diverse servo systems to satisfy those in packaging niches.

And there is controversy. One-brain versus distributed brain. Open architecture versus proprietary. But mostly, there is a need for compatibility.

Hartness says: "There's nothing I would like better than for you to call me tomorrow and announce 'There's a world standard bus. Everybody's going to use it and it only takes two wires, and you tie your things onto them with DIP switches.' We would convert tomorrow. We wouldn't even ask you now much it costs. Anybody who makes I/O devices would already be using it."

As of now, even those companies committed to an open architecture must decide on a communications system and can only use compatible equipment. Often they choose SERCOS because it is an international standard, is fast, fiber optic, uses only two cables for each machine, and is designed for motion control. It has an estimated 5 to 20% of the market, and is growing fast, although not as fast as some had hoped.

Glulalo says: "I think the guy who is going to make a lot of money is the guy who can make a device that says 'I don't care what bus you're on, if you put my

How low can you grow?

It is firmly maintained by servo-system suppliers and manufacturers that the price of a system has held steady or come down. But is that enough for growth? Several manufacturers commented quietly that they were still debating whether converting items in their lines had really saved them—and their customers—money. One machine with seven axes runs in the neighborhood of $30,000 and staff doubted that they would have paid that much for putting in a mechanical drive system.

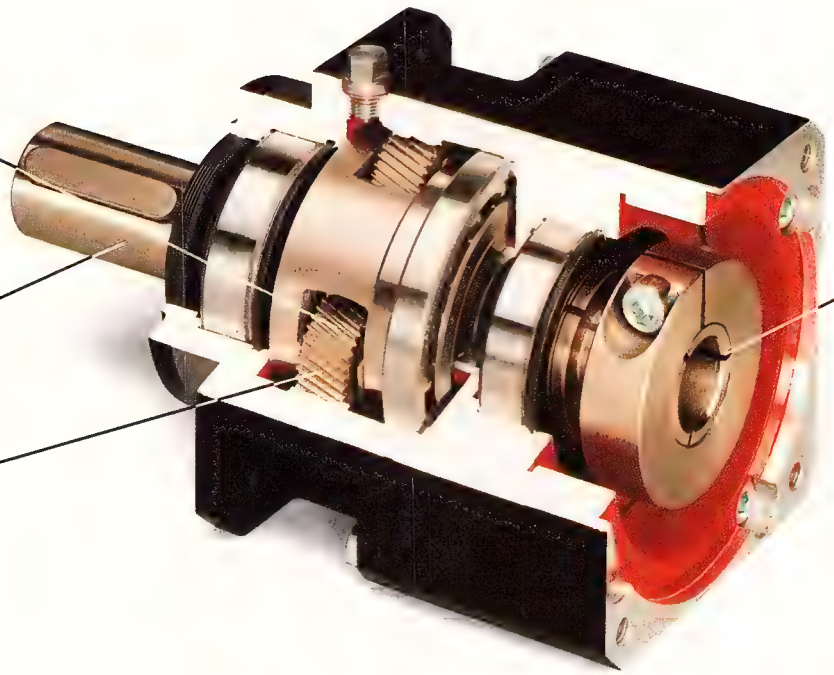
On the other hand, it allowed the machine to do more, to be more versatile, to exercise better control, and generally accomplish a lot more than the mechanical system. The consensus was that the cost is justified.

That cost may come down more, too. Japanese companies, and some American companies, have redesigned the motor with fewer parts, more ease of assembly, and thus lower cost, according to George Glulalo, president of Motion Tech Trends. Will that drop the bottom out of the servo motor costs? Not likely, says Glulalo. First, the motors are a small percentage of the machine cost, maybe about 5%. But if one fails, it shuts down 100% of the machine. So a designer is likely to be careful about the choice of motor and to stick with a familiar, successful brand.

"I do not see lower-priced motors impacting the business in any revolutionary way," Glulalo said. "Evolutionary, yes."

Your Gearhead's Accuracy

Our Gearhead's Accuracy



Highest Accuracy

High Torsional Stiffness

Advanced Gear Technology

Two Year Warranty

95% to 97% Efficiency

Readily Adapts To any Servo Motor

Quiet Running

Readily Available

If you're not using Stober's precision planetary gearing for your servo application – you're losing accuracy. Stober gearheads have just 3 arc/minutes of gear backlash. That's 40% better precision than the gearhead you're using now. Need optimum accuracy? We can trim backlash down to just one arc/minute. Compare what you're getting for your money. Start by asking for this free catalog today.

STÖBER

Stober Drives, Inc.

1781 Downing Drive • Maysville, KY 41056 • Phone: 606.759.5090 • Fax: 606.759.5045

http: //www.stober.com/dn • email: sales@stober.com

Circle 826

VENDOR-SUPPLIED COMPANY PROFILE

Products manage machine power

Warner Electric Motors & Controls Div. of Dana Corp. manufactures products that safely deliver and manage power in applications from communication (printing presses) to transportation (automotive cruise controls) to industry (robotics systems). Products include drives, motors, voltage-control and power-conditioning equipment, lighting controls, and speed controls, all of which are for use in the power conditioning and voltage control, adjustable speed drive, and engine-management markets.

Offerings include:

NEXTDRIVE intelligent ac drives. The NEXTDRIVE adjustable-frequency and all-purpose ac drive is compact and provides one of the best price/performance ratios in the industry. Features include an outstanding torque for its size and cost, wide speed range and virtually tripless action, an intelligent drive module that monitors and controls magnetic flux in the motor, and a removable keypad with user friendly menus and operation.

BRONCO ac motor controller. The BRONCO is for 1/8-to 1-hp induction or ac synchronous motors. This industrially hardened ac motor controller is available in chassis models. Enclosed models; are available for NEMA 4/12 and washdown environments.

WARPDRIVE Series step motor controllers and drives. The WARPDRIVE motor controller and drive series offers optimum performance in a full range of step motor positioning applications. This convenient, compact-packaged system with basic-like language for easy programming is compatible with SLO-SYN standard motors from NEMA 23 to 42 and high-torque motors in NEMA 23 and 24.

SLO-SYN high-torque stepping motors. SLO-SYN high-torque stepping motors double the torque of previous motors in the NEMA 23 and 34 sizes. Motor size, weight, and cost can be reduced while increasing system performance and productivity. Motors operate in increments of 1.8 full step, 0.9 half-step, or to 0.0072 microstep at a rate to 20,000 steps/sec (6,000 rpm) with non-cumulative ± 2% typical step accuracy. Holding torque ratings range from 170 to 1,155 oz-inches (120 to 816 Nem). Circle 827

device between your motor and any bus, we'll communicate.'"

Controversy aside, there is a powerful push toward servo automation.

Backman poses the question: "You have a $3,000 servo system versus $1,000 worth of mechanical metal parts, and someone scratches his head and asks 'Why?'" Well, says Backman, "Maybe it's worth a lot more to the end user to have one flexible machine instead of two rigid ones, or to not need to shut the machine down for a two-hour change-over."

Packaging technology vital to manufacturing success

Fruit juice. Candy bars. Computers. Motors.

They may seem like totally different products, but there's one thing they all have in common: packaging.

Indeed, the packaging is the first thing customers see of those products, and that alone makes packaging important. But, there's more, of course.

Packaging protects a product during shipment. It can build consumer confidence. It affects people's perceptions of the product within.

Take plastic bags. They're actually high-tech, high-volume packaging systems that not only protect the product, but catch the eye. Bag-making machinery makes that possible.

Plastic bottles are high tech too, thanks to computer-controlled multi-axis labeling machines.

Motors are critical parts of packing systems. Linear motors provide a particularly stiff and smooth direct linear motion, with no gears or screws to create backlash. According to Baldor, a linear motor positioning stage can be a single- or multiple-axis mechanical system. It includes, besides the motor, bearings, encoder, limit switches, cable carrier, and bellows. It provides direct linear motion without mechanical transmission devices. Baldor says linear-motor-driven positioning stages can move the payload vertically or horizontally at varying rates of speed and acceleration.

Linear motor positioning stages can be either ac/dc linear motor closed-loop stages or open-loop linear stepper motors, according to Baldor. The ac/dc linear motor positioning stage has bearings, encoder, limit switches, cable carriers, bellows, and ac or dc motor. The linear stepper motor is an integrated positioning stage with motor and bearings.

Baldor says in its Normag catalog that all linear motors are classified as either short primary or short secondary. The primary is the part of the motor with the motor windings that receives either ac or dc voltage. Depending on the type of linear motor, the windings are either assembled in a steel lamination stack or housed in a nonferous frame.

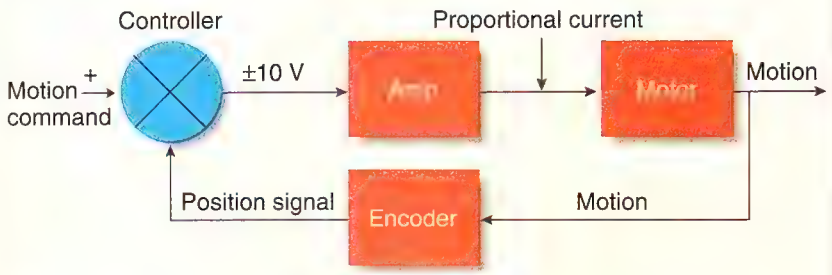
The secondary is made up of one or more permanent magnets, or a photo-chemically etched steel paten filled with epoxy, or a conductive plate of aluminum backed by a steel plate.

What are the advantages of linear-motor-driven stages? Here is what Baldor says:

1. Speeds up to 200 inches/sec
2. Accelerations up to 10gs
3. Smooth operation
4. Small, compact footprint
5. Reliable, non-contact operation without component wear or maintenance
6. Optimal dynamic and settling time performance because of linear motor stiffness
7. No backlash from gears
8. No slippage from belts

Closed/Open Loop Schematics

Typical closed-loop servo system for ac/dc linear motors



Source: Baldor

WARNER ELECTRIC® SLO-SYN® TD/TDC SERIES BRUSHLESS SERVO SYSTEMS

WARNER ELECTRIC® *Our SLO-SYN TD/TDC Series Brushless DC Servo Amplifiers and Positioning Systems offer you a simple, cost effective, upgrade from Stepper to Servo performance. These compact, stand-alone controllers include an integral power supply for operation directly off the line and drive NEMA 23, 34 and 42 frame size SLO-SYN DC Servo Motors with torque outputs from 5 to 120 lb-in. at speeds up to 5,000 RPM. Units also have a continuous current capability of 4 and 8A and peak currents of 8 and 16A. All are designed to meet UL, CUL and CE requirements. For more information, contact us at 800-787-3532 or fax 800-766-6366. Or visit our web site at www.warnernet.com today.* *People Finding A Better Way*

DANA

Circle 827

Cartoning machine enables quick changeovers

By replacing cams, chains, sprockets, and pulleys with servo systems, engineers from Klockner Packaging Machinery created a smaller, faster, more reliable, and more flexible cartoning machine

Charles J. Murray, Senior Editor
Design News

Klockner's Formula 2000 Series cartoners replaced *all* mechanical drives with servo systems.

The servo motors—all 800 of them—have run for four years without downtime. Every few seconds they perform their rituals: accelerating, pushing, decelerating, stopping. They do it seven days a week, 24 hours a day, in most cases. And they do it without fail.

In the world of motor manufacturing, such feats might seem unspectacular, even commonplace. Motor manufacturers, after all, often test scores of motors for months on end without ever seeing a failure.

These motors, however, aren't stacked on racks in a motor manufacturer's test facility. Rather, they are installed in packaging machines—an environment where they are subjected to dust, dirt, moisture, and countless manner of potential damage. Moreover, they are fulfilling a role in a type of machinery where downtime is a given. "There's a lot of maintenance associated with conventional packaging machines," notes Greg Conn, director of engineering for Klockner Packaging Machinery (Sarasota, FL), which built the new servo-based systems. "Belts and bearings wear out. Slotted sprockets need to be adjusted. That's the way it's always been."

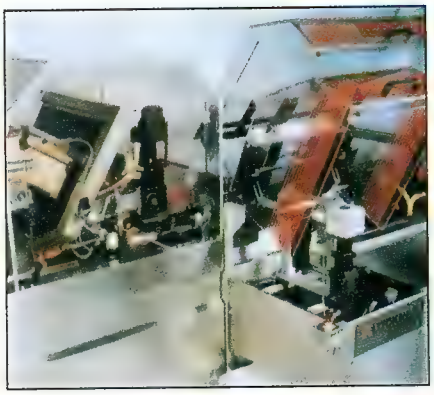
Until recently, that is. Four years ago, Klockner stepped gingerly into the world of electronic automation by incorporating servo motors on a few dozen cartoning machines. Their initial use of servos was crude compared to today's efforts. But they succeeded in placing the motors on 800-plus axes of operation and, in the process, learned some important lessons. "Servo technology doesn't wear out and doesn't need adjusting the way mechanical systems do," notes Jim Lyons, business direc-

tor of cartoning systems for Klockner. "It just repeats itself every time."

Reasons such as those are why servos are increasingly appearing in packaging machinery. "There's definitely a move toward servos," notes Rick Lingle, a senior editor at *Packaging Digest* magazine. "For the user, it seems to be the slickest, easiest way to go."

That, say Klockner executives, is why they decided to move toward servos during 1994. "We were trying to set the standard for packaging machinery in the future," Lyons explains. "This industry has traditionally relied on vendors to support very expensive machinery. We foresaw a time when customers would support the equipment totally on their own."

A few years earlier, such talk would have been considered unrealistic. Packaging machinery was, after all, extraordinarily complex. Unlike a typical machine tool, which might have only three or four axes of motion, packaging equipment often had 10, 15, or more. A cartoning machine, for example, requires separate axes for feeding the carton, opening major and minor flaps, feeding the carton's contents, closing all the flaps, and compressing them.



The loader and carton feed sub-systems replaced chains and sprockets with servo motors.

In the past, engineers typically accomplished all that with a dizzying array of chain-driven mechanisms, all of which borrowed power from a main line shaft. Using pulleys, chains, and sprockets, the machine transferred the rotary motion of the line shaft to the separate mechanisms. In the process, engineers had to ensure that the motion of each mechanism was precisely synchronized with the turning of the shaft. To accomplish that, they employed carefully shaped cams, usually custom-designed for the application. They also incorporated gear boxes to reduce speed and provide the necessary torque.

Such design tasks could be maddeningly complex for engineers. "Usually, the mechanical designers used time charts to keep track of what each axis did at each moment in time," Conn says. "And all of it had to be timed to the movement of that main line shaft."

If such tasks could be complex for vendor engineers, then they could be overwhelming for customers. Yet customers often faced that complexity when changes were called for. If, for example, a carton's size changed or its major flap moved, then the machine required adjustment. Many users could not make the changes on their own.

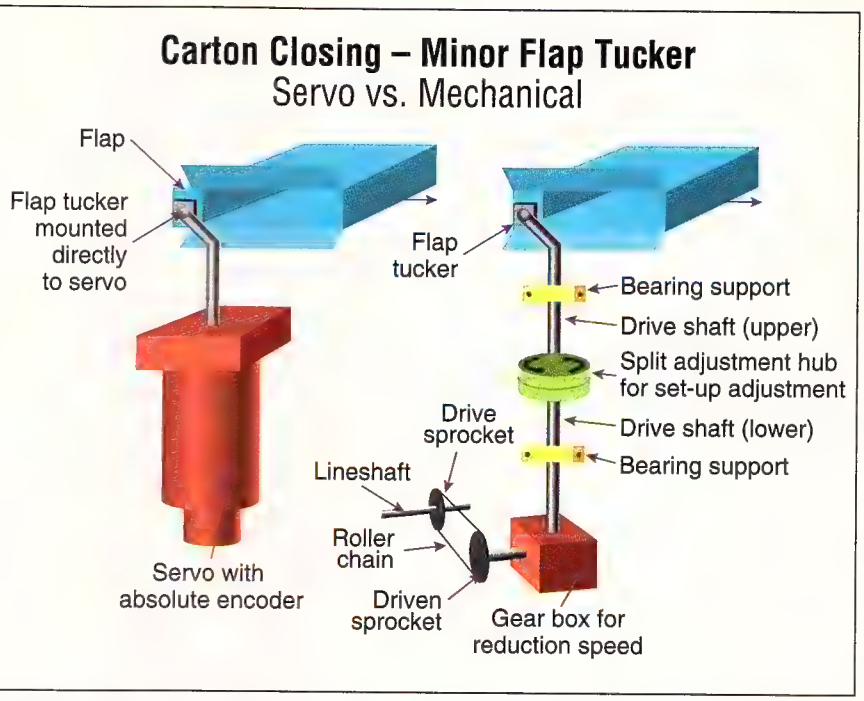
Worse, the mechanical components were subjected to considerable wear and

tear. As a result, chains, belts, sprockets, bearings, gearboxes, and other parts wore out. To deal with it, vendors such as Klockner kept maintenance personnel close at hand.

For all those reasons, Klockner executives wanted to change the way packaging machinery was built. By doing so, they reasoned, they would change the way customers used it. As a result, the company's customer list, which includes such giants as Nabisco, Kraft, and General Mills, could gain an edge on their competitors. The reason: Reliability would be greater; changeover, simpler; and downtime, almost non-existent.

Accomplishing that, however, was no easy task. "We knew we wanted to embrace servo technology," Conn says. "But there was still a design paradigm to overcome—we still wanted to drive the mechanisms through gearboxes, belts, and shafts."

As a result, Phase 1 of Klockner's redesign effort produced a hybrid-type machine. The machine's main line shaft was driven by a servo motor, but the rest of the machine still employed the old



Flap tucking: On the mechanical system, tucking in the flap of a carton required 43 separate parts. These were replaced by a servo motor and flap-tucking arm on the servo version.

VENDOR-SUPPLIED CASE HISTORY

Sensors deliver packaging accuracy

Paco Pharmaceutical Services Inc., a subsidiary of The West Co., is a major contract packaging and manufacturing service company in the U.S. and Puerto Rico serving the pharmaceutical and personal healthcare industries.

One way that Paco has realized significant savings, increased productivity, and improved quality while reducing change-over times is by installing integrated inspection and sensing systems on their packaging lines. Paco has standardized on PLATO sensor controllers from the API Div. of Airline Hydraulics (Bensalem, PA). These controllers incorporate Omron (Schaumburg, IL) sensors, which are also used independently on Paco's packaging lines. The installation includes a range of Omron's general-purpose and application-specific photoelectric, proximity, and measurement sensors.

"Significant cost savings have been realized because these sensing systems reliably prevent deficient products from making it to the end of the line," says Jim Buchanan, Paco's director of engineering.

In one application, a PLATO sensor controller equipped with an Omron ultrasonic sensor is integrated onto a cotton inserter conveyor to detect whether cotton is present in the bottle. Stray fibers can prevent the cap from sealing, so a combination of Omron photoelectric, fiber-optic sensors are used to detect whether cotton fibers are extending above the rim of the bottle as it exits the cotton insertion machine. Simultaneously, two Omron photoelectric sensors detect bottles that have been knocked down as they exit the cotton inserter.

In another application on the same line, an Omron Z4LA laser sensor and E3C photoelectric sensor detect and eject bottles that have skewed or missing caps and those bottles that have been knocked down as they exited the capping machine. The wide-beam laser sensor scans the bottle to gauge the height from the top, to determine if caps have been affixed correctly. The sensor's repeat accuracy of 5 microns enables precision detection of slight variations in the size and position of the object on the line. Circle 829

mechanical stand-bys.

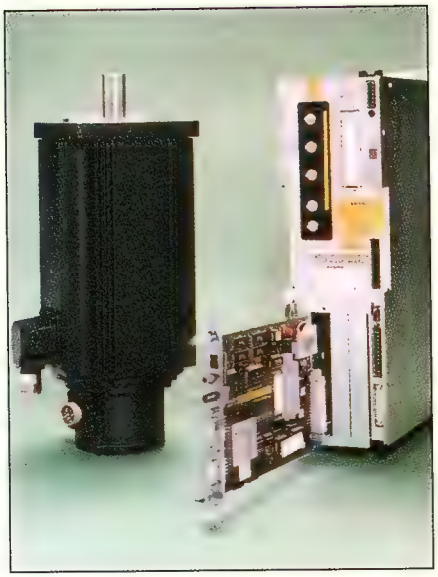
Realizing that they could improve, the company's staff of four mechanical designers and two electrical designers quickly moved to Phase 2 of the redesign, which involved the use of more servo axes. Still, though, the servo motors drove each of the separate mechanisms through traditional mechanical components. "When we completed that series of machines, we took a step back and asked ourselves if that was where we wanted to be," Conn recalls. "And we all agreed that, no, this wasn't where we wanted to be. We weren't fully utilizing the technology."

As a result, engineers in the company decided to take the next logical step: place servos on each of the individual sub-system axes. Such forward thinking, however, also came with a price tag. Servo technology, more so than most other control technologies, was known for high cost.

To offset that cost, the firm's engineers decided to make the ultimate technical leap: eliminate mechanical systems altogether. That meant tearing out the main line shaft, which for almost five decades had been the heart of all the company's packagers. "If we were really going to do this, we knew we needed to be looking five years ahead," Lyons says.

Eliminating *all* mechanical systems, however, offered tremendous cost savings at the same time. By disposing of all the cams, chains, belts, shafts, sprockets, pulleys, gear boxes, and other components, the engineers reasoned that they could cut their part counts by approximately 50%. One flap tucker on a cartoning machine, for example, used 43 parts. With servo technology, they could accomplish the same actuation motions with two parts: a flap tucker and servo motor.

Klockner engineers accomplished such technical triumphs by employing a scheme whereby all of the servo axes on the machine followed the operation of one main servo, or master. The master,



A DDS Digital Intelligent AC Servo Drive made by Indramat Div., Mannesmann Rexroth, powers the cartoner's various mechanisms. An integral encoder on one end of the motor provides feedback on its position, which is transmitted through a fiber-optic SERCOS databus to each drive.

a DDS Digital Intelligent AC Servo Drive made by Indramat Div., Mannesmann Rexroth (Hoffman Estates, IL), powers the carton in-feed mechanism. An integral encoder on one end of the motor provides feedback on its position, which is transmitted through a fiber-optic SERCOS databus to each of the other drives. As a result, all the other servo drives synchronize their motions to the movement of that main in-feed drive. In a sense, the in-feed drive is a counterpart to the old mechanical line shaft, in that it provides the impetus for the other drives to do their work.

Klockner engineers say that the Indramat drives and SERCOS fiber-optic ring were critical to the design of the system because they allowed for up to 16 axes of motion—considerably more than competing systems. Drives for all nine axes of the Formula 2000 IMC/SM (Intermit-

Timeline for Design

1994 — Klockner's first use of servo motors

1996 — Phase 1: Servo motors applied to machine's main line shaft

1997 — Phase 2: Servo motors applied to sub-systems

Late '97 — Formula 2000 cartoner eliminates main line shaft and uses servos exclusively

tent Motion Cartoner Servo Metric) and all six axes of the CMC/SM (Continuous Motion Cartoner Servo Metric) are contained in a single enclosure made by Hoffman Engineering (Anoka, MN). The enclosure also contains an Allen-Bradley SLC 503 Programmable Logic Controller, which is used to communicate with a touch screen and to monitor various guard circuits.

Klockner engineers say that the integral encoder was also important to the overall design. "We didn't want any proximity switches or photoelectrics that could be knocked over or misadjusted," Lyons says. "Here, we have the intelligence inside the motor."

The integral encoder also serves as an example of a corporate relationship that enabled Klockner to break new ground in packaging machinery design. Throughout the design of the Formula 2000 Series, Indramat used Klockner as a "beta" site to test new technologies.

The resulting Formula 2000 Series cartoning machine provides a speed of changeover rarely seen in the packaging industry. Instead of adjusting sprockets and re-designing cams, users merely adjust for carton size changes by altering a virtual "cam" profile in software. The system's software stores the cam profile as a recipe item, along with as many as 30 or 40 other cam profiles. When carton sizes change, users merely go back to the proper "recipe" and call it up for the machine to use.

"This way is much, much faster," Conn says. "The old way, we had to design the cam, make the part, then bring a service man in to install it." Setup times now take about half an hour, Conn says, whereas they used to take almost a full work day.

For users, the new design has provided four other key advantages. First, because it doesn't require the full rotation of a line shaft to move its sub-systems, servo technology is faster. In one application, Formula 2000 Series cartoners pack 800 snack bars a minute, whereas the mechanical system packed 300. Second, the servo system is smaller. Formula 2000's IMC/SM footprint measures 12 x 4 ft, compared to 21 x 6 ft for the mechanical system. Third, the system offers all its performance advantages for the same price as the mechanical system. And fourth, the design can be integrated with the newest servo motion systems by Allen-Bradley, thus giving users a choice of motion suppliers.

Equally important, the lessons learned in the design of the Formula 2000 Series cartoners are expected to serve the company and the industry in future years. "We learned a lot about how to apply servo technology to cartoning systems," Conn concludes. "And that design philosophy will eventually be applicable to all of our other packaging machines."

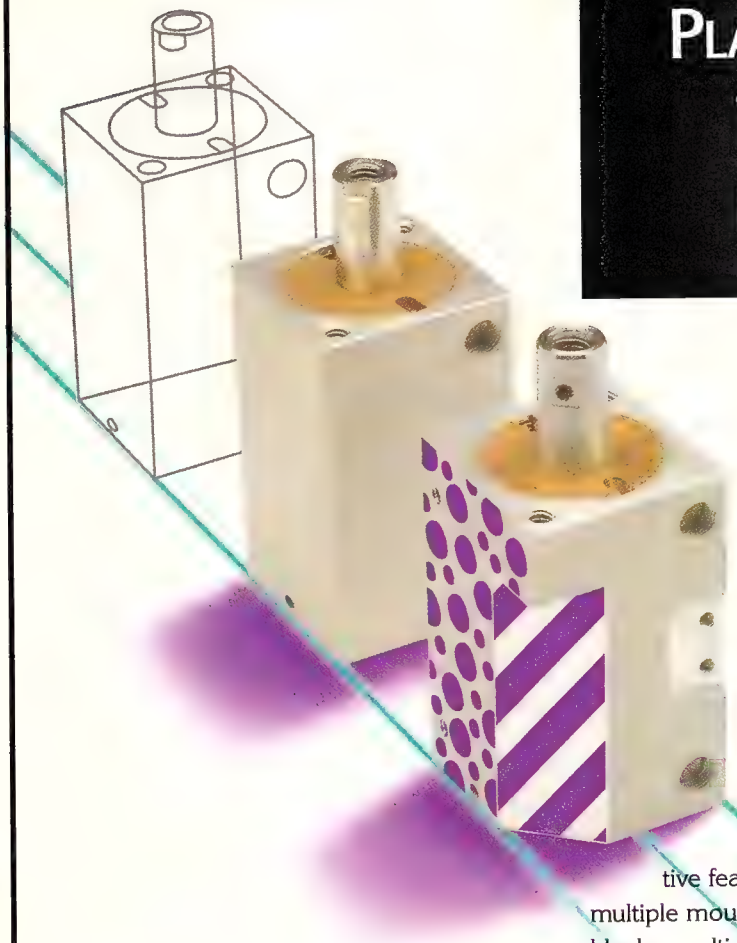
For more information

DDS Digital Intelligent AC Servo Drive from Indramat.....**Circle 750**

Enclosure from Hoffman Engineering .....**Circle 751**

SLC 503 from Allen-Bradley .....**Circle 752**

PLAIN-JANE CYLINDERS THAT CAN TURN RADICAL...FAST!

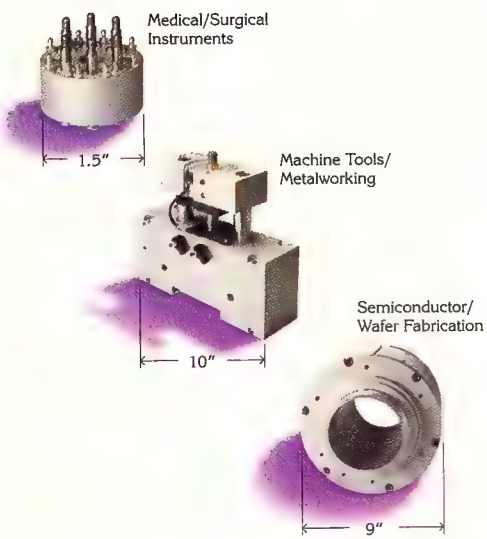


Compact® Application-Specific Air Cylinders

At Compact®...we design standards to be modified easily. Compact blurs the distinction among standard, modified and "special" products. We have more than 30,000 modified precedences on file representing the kind of design and performance challenges you're facing—and our responses to them.

Since we design standards to be easily modified, getting exactly what you need doesn't blow budgets or delay delivery. Compact Air routinely configures cost-effective features such as interference-relieving cut-outs, multiple mounting surfaces, guided rods, multiple cylinder blocks, multiple-position cylinders, multiple pistons, tunneled air passages to relieve connection troubles, hollow rods with linear- or rotary-action through rods, super space-saving rod end alignment couplers and much more...

Are you specifying commodity-type air cylinders into your designs? If so, you'll have room for improvement... with Compact® air cylinders. No one equals our breadth of standard configurations and options. When our standards won't do, remember Compact Air cost-effective, application-specific modifications—cutting your design time, reducing your assembly costs and improving your product's functionality. Call today for details!



Ask for a FREE copy of our COMPACT® CAD parametric software for easy specifying!

COMPACT AIR PRODUCTS

Compact Air Products, Inc.
P.O. Box 499 • Westminster SC 29693
Tel. 864-647-9521 • Fax 864-647-9574
Web http://www.compactair.com

Software 'EVOLUTIONIZES' packaging

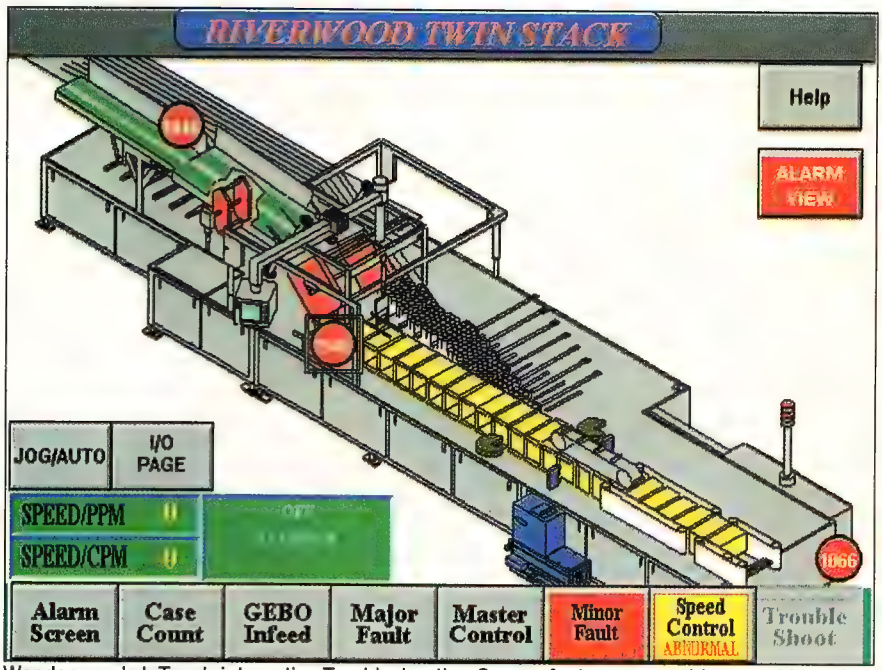
It increases productivity and production volume

David Stern, Contributing Editor

Is the packaging industry undergoing a revolution, as some would say? "I wouldn't want to stand up and say there's been a revolution in packaging machines or software as much as there has been a significant increase in throughput on some machines," says Paul Sagues, president and cofounder of Berkeley Process Controls Inc. (Richmond, CA). The machinery and the software for the packaging industry are pretty much the same as those used on the factory floor in industries such as silicon wafer handling, automobile and aircraft manufacturing, even fiberoptics.

If a company were to set up a brand new packaging plant today, it would find that there are two types of vendors out there. The company might purchase equipment and software from a single supplier. Or, it might hire a systems integrator, purchase factory floor equipment from one of any number of vendors, and use generic software to provide the human-machine interface (HMI).

Wonderware Corp. (Irvine, CA) and Intellution Inc. (Norwood, MA) are the undisputed leaders in the factory-floor software marketplace, which includes the packaging industry. "They both market general-purpose human-machine interface software that provides the link between the operator and the machinery, in this case packaging," says Bill Thompson, senior analyst for Automation Research Corp. (ARC), a manufacturing-market research and consulting firm located in Dedham, MA.



Wonderware's InTouch interactive Troubleshooting Screen features a machine graphic and red locator buttons that indicate location of faults. When pressed, the buttons launch the InSupport troubleshooting database with the associated symptom.

"The factory floor machinery could be of any sort, but Wonderware and Intellution are the PC-based software end that provide the operator with the data-entry fields, etc.," he adds. Other vendors include Rockwell Software, a division of Rockwell Automation, which also owns the Allen-Bradley

line; Siemens; GE Fanuc Automation; and ES Data Corp., he says.

Here are profiles of three software suppliers to the packaging industry:

Berkeley Process Controls. Almost 17 years old, Berkeley Process Controls manufactures machine controls and associated software to optimize the HMI with the equipment.

"I think in many ways we invented the concept of the machine controller," says Berkeley president Sagues. "We started talking about the notion of a device called a 'machine controller' back in 1987. Everybody used to talk about motion control or PLCs (programmable logic controllers). Then they talked about the combination of motion and PLCs."

Berkeley began working in motion control in the early '80s, "searching to understand closed-loop servo, for one thing," Sagues says. "We developed one of the first true digital multi-axis servo controllers and had some success selling the product as a motion controller. But then we realized that was just a small part of the problem. Being able to close a servo loop was one thing, but what about doing something with that; what about the auxiliary loops, what about the input/outputs required to do other parts of the machine," he says.

In those days, a system integrator had to put those pieces and parts together. "That's been the way most of the industry has worked since then," Sagues says. "We pioneered the notion of a new product that integrates motion control, I/O control, communications, and machine sequencing into a single control system. That control platform has been our heritage. We were always the leader in technology—the first in 16, 32, and then 64 bits. We are still the only one running a 64-bit platform," Sagues notes.

Packaging has been a natural avenue for Berkeley. "We've had a strong position in high-end machines, in wrapping all kinds of paper products, for example. If you buy tissue in the grocery store, it was probably wrapped on a system from Berkeley Controls," Sagues says.

Now packaging is in need of higher-speed mechanisms, and Sagues says Berkeley provides its customers with controls that "allow them to synchronize and perform tension control of the webs, to pass the products back and forth, to stack and compress the packages, and to apply the glue. Although we are diversified in everything from aircraft to semiconductor, packaging has always been a good area for us," Sagues asserts.

Of course, Berkeley offers its own software optimized to its equipment, and sells it as a complete package. "It's analogous to a PLC," says Sagues. "When you buy it, it obviously has a lot of software in it, but you can't buy the software without the hardware. It's like taking the brain out of the body—the brain doesn't function without the body. The PLC's software allows us to very concisely present the user with the goal of doing Boolean logic control."

Berkeley's products, says Sagues, "consist of hardware that contains a lot of software. Just as you add ladder

logic on the PLC, you add software that controls the sequence of the machine. We provide a vast amount of software that understands things such as servos, I/O, and machine referencing. We also supply the servo drives and motors, gear boxes, cable, operator interfaces, and then a link into the enterprise-wide network, which is generally a Microsoft network."

Berkeley's connection into the world of Windows NT is OpenLink, software for supervisory and diagnostic data interchange. "We take a very different approach when it comes to Windows connectivity," Sagues says. "If you take an NT workstation, open it up and plug in a motion control board or network connection card, you now have a computer that is absolutely tight. Three years from now, when that workstation fails, what are you going to do with it?

"Our approach has been to keep the Windows NT environment pure. That is, you buy the workstation and we make a very clean connection at an open level via Ethernet into that environment. We don't marry ourselves to a specific brand of hardware or version of software because we recognize that next year's version of Windows NT and the hardware used are likely to be very different. How many people remember when OS/2 was going to be the operating system of the future? Didn't happen, did it?" he asks.

Does Berkeley believe it competes with the generic software suppliers like Wonderware and Intellution? "We compete with a lot of people in a lot of ways, depending on how you look at it," Sagues points out. "In some markets, we compete with a PLC; in some markets we compete with the in-house groups that are designing machines.

"Wonderware and Intellution are not our biggest competitors in as much as they represent a different architectural direction. People successfully use Wonderware front ends on Berkeley and other people decide to use Wonderware with PLCs. It's not a competition as much as it is the ultimate design someone came up with," Sagues says.

Wonderware Corp. Marketing gurus will tell you that the first product to hit the market is most often the one that wins. How many people remember

Who the players are

Following is a partial list of vendors of hardware and/or software in the manufacturing and packaging marketplace.

ABB Industrial Automation and Drives
ABB Industrial Systems Inc.
Allen-Bradley Co. Inc.
Aspen Technology Inc.
Azonix Corp.
Berkeley Process Control Inc.
Bristol Babcock Inc.
Cegelec
Control Systems International Inc.
Control Technologies Corp.
Dresser Industries
Eaton Corp.
Eaton Corp./Cutler-Hammer Products
Elsag Bailey Inc.
Elsag Bailey-Hartmann & Braun
Emerson Electric Co.
Ferranti International plc
Fisher-Rosemouont Systems Inc.
Forney Corp.
The Foxboro Corp.
Gensym Corp.
GE Fanuc Automation
Hartmann & Braun AG
Hitachi America Ltd.
Honeywell Inc.
Honeywell-Measurex
Iconics Inc.
Intellution Inc.
M.K. Juchheim & Co.
Jumo Process Control Inc.
Klockner-Moeller Corp.
Mitsubishi Electric Automation Inc.
Moore Products Co.
National Instruments
Nematron Corp.
Olin Corp.
Opto 22
Rockwell Automation
Rockwell international Corp.
Rockwell Software Inc.
Schneider Automation Inc.
Schneider Automation SA
Schneider Automation GmbH
Siebe plc
Siemens AG
Siemens Energy & Automation Inc.
Siemens Industrial Automation Inc.
SWAMI
Toshiba International Corp.
US Data Corp.
Valmet Automation USA Inc.
Westinghouse Electric
Wonderware Corp.
Yokogawa Industrial Automation America Inc.

VENDOR-SUPPLIED CASE HISTORY

Controller combines small size, benefits

Engineers at Technology 80 have succeeded in developing what they say is the industry's first full-featured motion controller compliant with PC/104 Specification Version 2.3. Called Model 5950B, this controller can be packaged in small spaces not possible before. Applications include packaging, machinery, robotics, and medical instruments.

The form factor requirement demanded the board measure 3.55 x 3.775 inches, and yet the goal was to add functionality, flexibility, and user-friendliness to the design.

Precise control was a top design priority. As a result, engineers incorporated a 16-bit, high-precision monotonic DAC instead of using widely accepted audio DACs. According to the company, this provided linear accuracy. "It opens the door for higher-precision applications with a board that can be packaged in smaller designs," says Marketing Manager Scott Wyman. Other motion controllers use inexpensive audio DACs which are not suited for instrumentation.

Building upon previous platforms, engineers expanded the robustness of the I/O. High-speed clamping diodes were used, and extended the transient protection to be far more resistant to high-speed external spiking and noise than in standard motion controllers.

Configuration jumpers and adjustment potentiometers were eliminated. "This is a big advantage for users because the conventional functions are now factory set and/or stored in non-volatile memory on the board. Minimizing our customers' time for set-up and mistakes was an important criterion for us," says C.O.O. Jim Burkett. On-board LEDs have also been eliminated, and accessibility is available via software.

The PMD 1401 DSP chip with an enhanced custom I/O chip handles the servo algorithms with PID and velocity feedforward filtering for all four axes. It performs the intensive computational tasks required for high-performance applications such as digital velocity, torque, and position control. S-curve, trapezoidal, and velocity motion profiles are also available. Circle 834

WordStar, the word processor? It was clunky and difficult to use but, since it was the first DOS-based word processor on the market, it became the leader and remained so for much of the 1980s.

Wonderware, founded in April of 1987, was the first, too. While it was not the first HMI product out there, it *was* the first one developed on a Windows platform.

"Our first product, the InTouch human-machine interface, and everything we've done since then is on Windows," notes Don Allen, director of corporate communications at Wonderware. "The problem with DOS is that it's not terribly graphical, so it's not easy to create graphical screens. The DOS-based products generally looked more like a schematic wiring diagram than anything else. It was even difficult to use pixel graphics, which was the rule of thumb at the time," says Allen.

"Putting InTouch on Windows provided almost a Macintosh look and feel to the product. You could draw your factory-floor equipment on-screen and link it easily to the process by physically wiring the InTouch to the PLC. Then, InTouch collected the signals from the PLC and converted them into engineering units—temperature, pressure, etc. And you populated the screen with animations of what was going on, as well as with direct read-outs of any readings involved. It was all much easier on the graphical Windows platform," he points out.

You didn't have to be a programmer to use InTouch. Comments Allen: "When we introduced that first product, in August 1989, everyone laughed and said, 'Windows—that's a toy!' We had to sell Windows as hard as we sold InTouch," he adds. Allen also says Wonderware was fortunate in that it had no legacy systems. "It was Windows from the start, and fortunately for us, Windows took off.

"We started out with that one high-

Open systems.

To some, that means embracing a Windows or a UNIX platform in system or software design. But that's not what Paul Sagues, president of Berkeley Process Controls (Richmond, CA) means by the term.

To Sagues, it doesn't make sense to design software for a control system like Berkeley's Series-64 on a platform like Windows or UNIX. To him, it is more important to optimize the software to the control system and *then* to accommodate customers by providing easy linking capabilities with Windows 98 or Windows NT.

A case in point is Berkeley's customer, Will-Pemco Inc. (Sheboygan, WI), a market leader in manufacturing and marketing complex paper ream packaging equipment. It's been almost 10 years since Will-Pemco had to choose the control system for its next generation of wrapping machines.

Will-Pemco had some very strong requirements. It needed equipment that provided outstanding performance in the form of superior throughput.

The machine had to wrap a variety of package sizes—from 7 x 10 to 12 x 18 inches—and had to switch from product to product with no set-up delays.

Registration accuracy had to be accurate within one-sixteenth of an inch on every package.

The Human-Machine Interface (HMI) had to be simple and intuitive to reduce operator training requirements.

The machine had to be extremely reliable because, as part of high-volume production lines, failures on the factory floor would cost Will-Pemco thousands of dollars in on-site assistance and, more important, would damage the company's relationships with its customers.

But, most important of all, Will-Pemco needed backward compatibility in the control products to offer its customers ongoing enhancements to their machines over the product lifecycle—as well as the ability to amortize development costs over the machine's life.

Although the original ream wrapper control software was developed for Berkeley's Series-32 controller, "I am pleased to say that Will-Pemco's engineers did not miss a beat getting the new machine running with our Series-64 controller," says Sagues. "They were able to get their new machine to market without wasting time duplicating previous efforts."

Says Tim Paulson, a member of Will-Pemco's electrical engineering staff, "I was expecting it to be slow and difficult. But, it turned out to be easy. In fact, we can run the same software on the Series-32 and the Series-64."

Now, nine years have passed and several hundred wrapping machines have been built since Will-Pemco's initial purchase of a Berkeley control system—and the company is still using machine controllers from Berkeley.

"Will-Pemco has replaced our Series-32 controllers with the Series-64 as the control system for its machines, and its software investment has been preserved," says Sagues.

Compact Control System Updates Food Overwrapping Machines

PC/104 servo controller integrated into an intelligent operator interface with **ControlWare** improves speed, simplifies change-overs and dramatically reduces packaging wastes.

Chicago, IL – A system integrator called with a particularly challenging retrofitting project for a large snack food producer. The company needed to modernize its aging mechanical overwrapping machines located in North America and Europe to improve product throughput, simplify product changes and reduce packaging wastes.

They wanted the flexibility of a PC-based control system, but had a very limited space for hardware on the existing machines to work with.

The application required four axes of servos to control the lug conveyor, fin seal, rotary seal bar cutoffs and to power-unwind the web roll containing the packaging film. The solution had to integrate complex camming, ratioing and registration at speeds high enough to meet the manufacturer's 300 units-per-minute throughput target.

To meet these application demands, the system integrator installed a Tech 80 **Model 5950B** PC/104 4-Axis Servo Controller into an Eason **Model 3100** Operator Interface & Machine Controller. The 5950B's **ControlWare** driver simplified the implementation of the fundamental motion requirement of homing, velocity/position capture and camming. Yet flexibility is offered to address the application-specific motion requirements, which in this case was high-speed registration.

Eason's Model 3100 offered integration of the MMI, logic and motion control, via a PC/104 interface, into a single compact control package that easily fit within the limited space available.

The modernized systems exceeded the customer's throughput demands, simplified product change-overs and virtually eliminated packaging wastes.

For more information:

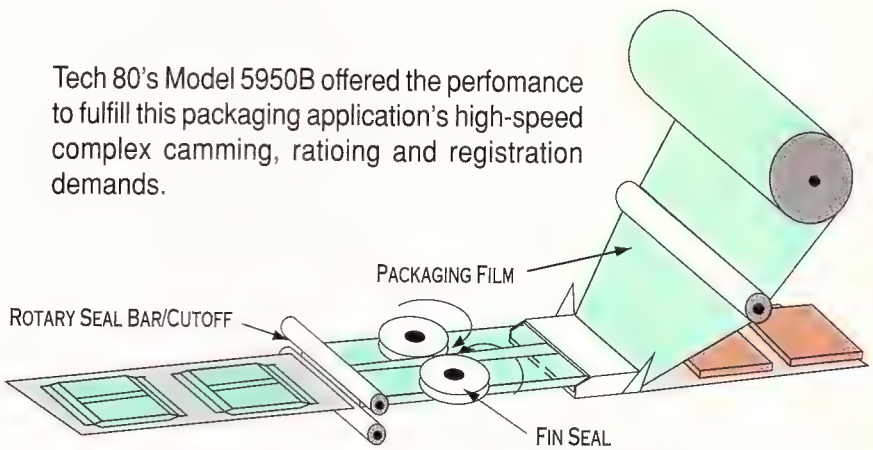
http://www.tech80.com/dna/wrap.html

Technology 80 Inc. *658 Mendelssohn Ave. N., Minneapolis, MN 55427; (612) 542-9545*

Eason Technology, Inc. *241 B Center St., Healdburg, CA 95448; (707) 433-2854*

ControlWare *245 Northland Blvd, Cincinnati, Ohio 45246; (513) 771-6676*

Tech 80's Model 5950B offered the perfomance to fulfill this packaging application's high-speed complex camming, ratioing and registration demands.



No bottlenecks for this bottler

Art Hogan loves to watch the ballet of bottles at the Miller Brewing Co. plant where he works in Irwindale, California. Bottles dance down the five filler lines. Cans cavort through three other filler lines. Kegs lumber along a filler line of their own. But, as much as Hogan loves to see the bottles in motion, he really hates to see bottlenecks.

The 15-year-old Irwindale brewery produces about 5.6 million barrels of beer each year (one barrel equals 13.7 cases of 12-ounce cans). The plant has a 1,100-barrel brew house that produces a range of products including Miller Beer, Miller Lite, Miller Genuine Draft, Miller Genuine Draft Light, Miller High Life, Meisterbrau, Milwaukee's Best, Sharp's, Lowenbrau, Lite Ice, Red Dog, Magnum and MG Dark, and Asahi for export.

Many of these brews combine promotional marketing with packaging in one step, using a Twin-Stack packing machine built by Riverwood Intl. Corp. (Marietta, GA). The Twin-Stack machine is 38 ft long, weighs 40,000 lbs, and can pack up to 3,000 cans of beer a minute. The larger size of each package permits the use of both high-impact graphics that are more appealing to customers and of strong three-ply carry handles that make it more convenient to buy more product.

The system requires extensive use of photoelectric and mechanical sensors to assure that machine sequences occur properly. A coating of dust on a sensor can cause a machine to shut down and create the bottleneck that Hogan dreads.

Based on studies conducted at other facilities, Miller management anticipated that frequent machine stoppages could cause production problems with the packer unit. Riverwood Intl. solved the problem by developing a prototype Advanced Customer Interface System (ACIS) based on InTouch, the human-machine interface (HMI) produced by Wonderware Corp. (Irvine, CA).

Riverwood Intl.'s Advanced Operator Interface Team added an expert diagnostic system to the machine's supervisory control system, using Wonderware's FactorySuite industrial automation software, and created an on-line troubleshooting application that was integrated tightly with Wonderware's InTouch module.

The solution tightly integrates the supervisory-control and data-acquisition features of InTouch (already developed to Miller's "look and feel" specifications) with the new expert diagnostics capabilities. ACIS provides a graphical machine control and information center for operators that gives details on packaging parameters (in the form of recipes) as well as on machine performance and historical trend data. The resulting automated repair application has eliminated the dreaded bottleneck, much to Hogan's delight. Here's how it works:

Art Hogan, maintenance technologist at Miller Brewing Co.'s Irwindale, CA plant, checks the main terminal used to run the plant's Riverwood Intl. packaging machine. If a bottleneck occurs, operators touch a button on the screen, and up pops an overview screen that shows exactly where the problem is. If operators are unsure how to resolve the problem, pushing the "How?" button provides a tutorial on how to fix it. The machine is usually back online in minutes without having to call in a service technician.

The Twin-Stack system routes incoming conveyor lines of cans into upper and lower tiers and divides them into configuration groups for packing the appropriate size container. Flat-fold cartons for the beer cases are picked from a magazine stack by vacuum cups mounted to a four-head rotary feeder, which unfolds each carton and aligns it for packing. A tier separator pad is inserted between the layers of grouped cans moving down the lanes, and the cans are shunted into the opened cartons by cam-activated pusher arms. Hot glue is applied to the carton flaps before they're folded over and compressed to complete the packaging process. Once the expiration date is printed on the box, the finished packages are discharged from the machine by driven belts.

The packaging flexibility provided by the Twin-Stack machine also makes it easier to package different pallets for different markets, whether it's for different states or for different countries.

The ACIS program runs on an Eaton FactoryMate 486-based personal computer housed in an electrical cabinet with a Modicon PLC. The two communicate via the Modbus Plus data network. The primary operator control panel consists of a 14-inch color touchscreen sealed in a Hoffman console to protect it from contamination or damage in the factory.

There are nine main graphic displays within the main control panel, including the line conveyor, glue station, package change, vacuum pumps, clean out, carton control, machine drive/control and jog/auto, and maintenance mode. Other screens provide a machine schematic as well as information on its operation, alarms, and production data.

"The beauty of this system is that it makes our operators able to handle even more of the job; they now know what to do without calling for help, and that lets us make better use of our machinists and service technicians," says Hogan. "On those now-rare occasions when a repair technician has to be called, operators can tell them in advance what's wrong with the machine and they know what parts to bring. Plus, the on-line documentation eliminates having to carry large manuals to the machine site."

ly graphical product and, as we added functionality over the years, decided to follow the Microsoft example and offer a suite of products. The FactorySuite we sell now offers a lot of functionality at a low cost," Allen says.

Not specific to packaging, these are generic tools used to create applications that fit a particular industry. Allen points out that Wonderware products are used in everything from oil refineries and production to gas distribution, automotive manufacture, electronic assembly, and semiconductors.

Over the years since then, through both acquisition and internal development, Wonderware has added a number of other products that are complementary to the original HMI software. The company now offers an integrated set of automation software it calls the FactorySuite 2000 HMI system. Its components include:

- InTouch HMI for visualization
- InControl for Windows NT-based machine and process control
- Industrial SQL Server, a real-time relational database for the plant floor
- Scout, an Internet/Intranet tool for remote data viewing
- InTrack for resource management
- InBatch for flexible batch management

"Over the last three years we've redesigned those separate products and integrated them into one package, so you can have a development toolkit that lets you use any or all of the capabilities in a single environment," Allen adds.

Wonderware also provides a relational real-time database built on Microsoft's SQL Server. Though Allen has praise for Microsoft's SQL Server database, he notes that Wonderware had to overcome a challenge: "SQL Server couldn't handle high transaction rates," he says. So the company's development staff tweaked the software to give it more power. The company added algorithms that let users handle up to 20,000 transactions per second, instead of handling 400 or 500 per second, which is typical in a commercial application. "That allows us to collect information from all the plant floor devices in real time," Allen says.

"We also added algorithms that compress the data to about 2% of its normal storage-space requirement, so you can store large amounts of data in a small amount of space. And it happens transparently. The end result: The system can handle a lot more data a lot faster," he concludes.

Intellution Inc. So, what was the first HMI product to hit the market? Intellution says its FIX product was. Founded in 1980, Intellution introduced FIX, the first DOS-based control and monitoring software product, in 1984.

"In the company's earliest days, we were acting as a systems integrator while our founder, Steve Rubin, was developing a distributed database that's a lot different than some of the other HMI products out there," says the company's Michelle Tegtman. The company would not embrace the Windows platform for some 10 years though. "In those days, people weren't

sure that Windows was actually going to be the operating system," Tegtman adds. "It crashed an awful lot."

In 1993, Intellution introduced FIX for Windows NT. Tegtman says Intellution has since been busy developing its own set of integrated HMI products it calls FIX Dynamics. Its components include:

- FIX Dynamics, a fully integrated component object solution for manufacturing
- FIX Paradym-31, SoftLogic control software
- FIX Dynamics VisualBatch, a graphical batch control environment
- FIX Web Server, Internet software
- FIX Broadcast, Internet information software

In 1995, Intellution released PlantTV, what it calls the first software to bring data from multiple sources into a single application. The following year, it came out with a batch product, VisualBatch, which provides users with a graphical batch-control environment for modeling plants, managing recipes, executing batches, creating electronic batch records, and generating reports on any batch process.

"And in 1997," says Tegtman, "the company bought Wisdom Controls, which is a PC-based controls software company. Also in 1997, the company released two Internet products, FIX Broadcast Network, which provides 'push' technology to send corporate and manufacturing information to the desktop automatically, and FIX Web Server, a thin client product that allows users read-only access to view the plant from any web browser anywhere."

For more information

Machine controls and software from Berkeley Process Control ..**Circle 753**

FactorySuite 2000 HMI system from Wonderware .....**Circle 754**

FIX Dynamics HMI products from Intellution .....**Circle 755**

Mechanical Technologies Pack ENERGY SAVINGS

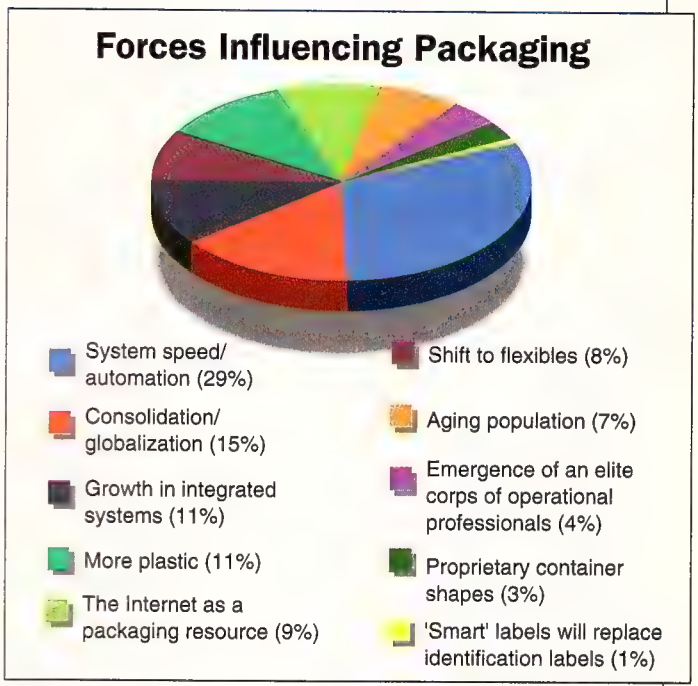
Advances in brakes and clutches help packagers react to customer needs

Yvonne F. Bernard, Contributing Editor

The better, faster, cheaper chorus that has been a constant refrain in the ears of engineers across the country is being heard by sectors that have traditionally marched to their own beat. It echoes forcefully in the ears of packaging professionals, honing the three themes into one sharply focused objective: a move toward more efficient consumer response. Key requirements to achieve this objective include better application accuracy, repeatability, user-friendly operator interfaces, closed-loop systems, simplicity in programming, and quick response time.

While many in the industry are turning to servos and stepper motors to improve performance, those technologies aren't always the best solution. Servomotors are considered cost effective at lower torque ranges. At higher torques (above 10 hp), the cost/benefit ratio grows high and points to a possible need to use an alternative method for motion control. In the contract packaging business, cost of equipment is a driving force. The less cost the company incurs, the less they have to pass on to customers. They and other companies in similar situations lean toward traditional methods of packaging, the lower-priced technology of clutches and brakes. Roughly 43% of the industry depends on companies that produce brakes, clutches, and limiters. What is happening with these technologies in response to industry trends? These companies are responding to the changing times in the packaging industry in some unique ways.

Ed Brooks, senior technical representative for Horton, says that there is still a demand for traditional technologies. Horton produces clutches, brakes, and torque limiters. In response to industry trends, Horton has offered some innovations in each of its lines. The company's Air Champ® air-actuated products are examples of innovations to existing technology in response to industry trends. The air-actuated products provide superior dynamic force, facing life, response time, and energy efficiency, Brooks says. These units use static air pressure to disengage brakes. Compressed air is used in place of electricity, reducing energy usage and cost.



System speed is the major force influencing packaging technology, according to a recent Packaging Machinery Manufacturers Institute supplier survey.

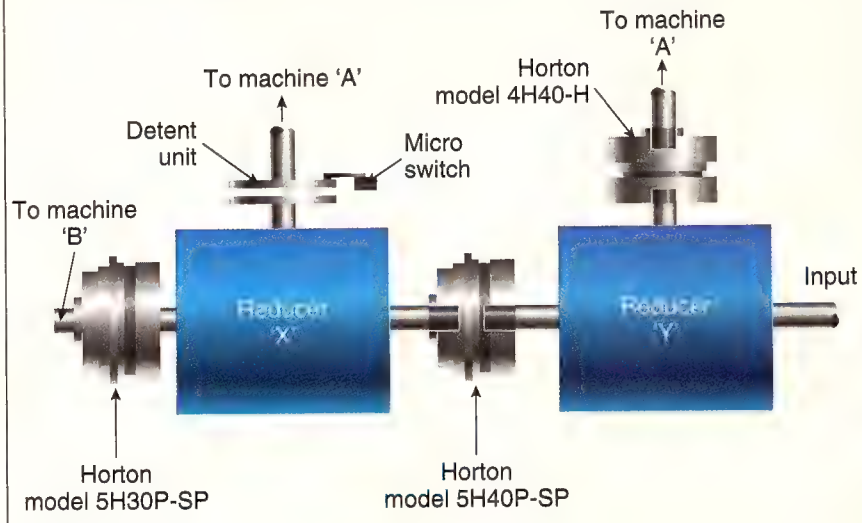
Packagers of snack foods have benefited from use of a machine utilizing an air clutch/brake combination. Packaging lines with that combination handle cellophane bags gently. Soft starts and stops can be achieved by use of air-pressure changes. Another case study from Horton's files highlights a manufacturer of cleaning, filling, and packing machinery for the bottling industry. The manufacturer needed to connect and disconnect one machine from another while maintaining synchronization during operation. Also required were a way to synchronize two functions within a single machine, and finding the most effective way to accelerate and decelerate in order to introduce inertia for shock reduction. The solution included several Horton single-posi-

tion clutches. Model 5H30P-SP addressed the connect/synchronize issue between the two machines. Model 5H40P-SP is handling the problem of performing multiple functions with one machine. Model 4H40 solved the acceleration and deceleration problem. Replacing an electric clutch, the system is also explosion proof.

Another approach that manufacturers take is to improve the components themselves, making them heartier. Horton has a line of components that are sealed and have a nickel-plated housing. Housings can be cleaned easily, minimizing down time. The sealed housing protects the component from contamination and corrosion, thus keeping the machine up and running. These same components are approved by the baking industry.

Protecting components from contamination and corrosion is a popular approach. MRC has a new Marathon™ Series for food and beverage processing equipment. This new Marathon Series is designed for extended service life. The units begin with a corrosion-resistant

Incorporation of Horton Single-position Clutch



Clutches are illustrated in schematic coupling mount. In actual use, clutches are mounted on one shaft with an external coupling to the other shaft.

insert bearing. They are coated either with MRC's new AmaRC™coating or with stainless-steel. They resist frequent wash downs with water and with acidic and caustic solutions. A major manufacturer of condiments was encountering bearing failures on its mustard-packaging line about every three months. MRC says its Marathon Series bearings improved that record to eight to nine months before failure.

Robotics. The changing face of the packaging industry is never more evident than when noting the increase in the use of robots and automation. Robots are no longer just for palletizing and unitizing. Manufacturers of packaging equipment have begun to take advantage of the versatility of modern technology, applying it to automation and in the creation and incorporation of robots. Emmanuel Cerf, of PolyPack Inc., says customers want more versatile machines. Marketing is changing, customers want design changes with new packaging almost yearly. Poly Pack recently developed a new shrink-packaging machine called the Rock. The company says it is a versatile machine that has integrated a robot with a shrink wrapper. The combination of the two makes for low maintenance, simplified changeovers, and minimal down time, Cerf says.

The robot consists of common mechanical parts. It is a pick-and-place module that plugs into the shrink bundler and is used to collate products. Mark Staack, technical sales manager for Poly Pack, says the high-end model will be capable of 80 bundles/minute and the low-end model of 25 bundles/minute. These speeds will vary with additional operations.

Jackson Hutton and Great Lakes Packaging will soon be introducing their model TS37, a horizontal high-speed shrink-packaging machine. It is a continuous-motion machine that can achieve packaging line changes in as little as five minutes, the company says. This machine can wrap everything from pencils to stacks of paper. Jackson Hutton contends that innovations in automation in this instance surpass the introduction of servos. To achieve the kind of versatility the model TS37 offers, packagers would have to use numerous servos, increasing costs, the company says.

Times are changing in the packaging industry. The need to be responsive to consumers; to work smarter, faster, and cleaner; to prepare for the trends of the coming century—all are driving the packaging industry to come up with such innovative ways as these of accomplishing the job.

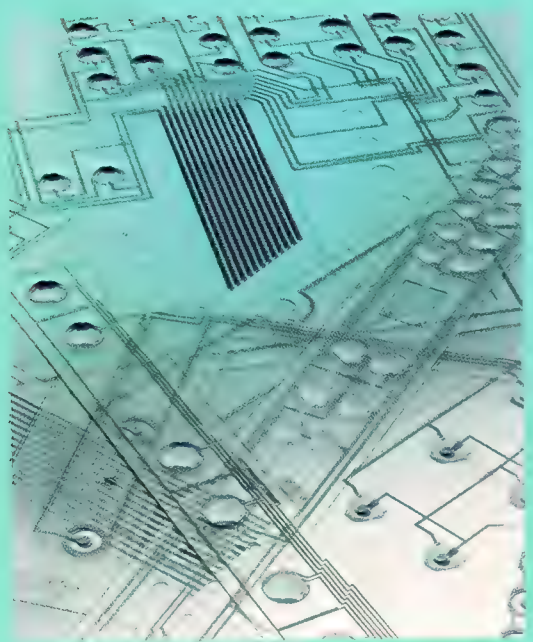
For more information

Air Champ air-actuated products from Horton .....**Circle 756**

Marathon Series bearings from MRC .....**Circle 757**

The Rock shrink-packaging machine from Poly Pack .....**Circle 758**

TS37 shrink-packaging machine from Great Lakes Packaging.....**Circle 759**



For Systems Designers ...

the shapes of things to come!

Topflight shapes the future!
Custom, creative conversions by Topflight provide alternative design options to traditional electronic, appliance, medical and assembly-line parts ...

Efficiently
Effectively
Economically

precise die-cutting for precision parts

Gaskets
Seals
Subassemblies
Insulators
Buffers
Assembly Line Parts

conductive ink technology

Sensors
Conductors
Shields
Circuitry
Signal Generators
Static Dissipaters

adhesive materials expertise

Foam Seals
Multi-Level Subassemblies
Layered Laminated Fabrications
Double-Faced Connectors

unique capabilities

Custom Adhesive Coatings
Patented-Process flexible RFI Shielding
ESD Grounding Systems
UV Hard-Coated Viewports and Lenses
Texturized Bonding Elements

plus ... your next design challenge!

Topflight is your proactive design partner for the new millennium.

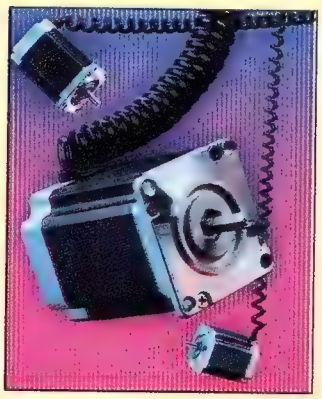
Topflight

An ISO 9001 Company
800 233 9386
717 227 5211
www.topflight.com

Circle 845

PRODUCTS

STEPPING MOTOR



NEMA 23 high-torque stepping motor with coiled cable is for applications such as X-Y positioning equipment, where motor movement and load capacities are critical to precision operation. The coiled cable packages lead wires and eliminates cable strain by extending and contracting during motor movement. Fully extended cables reach up to 10 ft and are available in other lengths. Based on 1.8-degree step angles, this two-phase hybrid step motor achieves high angle accuracy in full, half, and high-resolution microsteps. Motors are available in 1.8-, 2.2-, and 3.1-inch lengths, with bipolar holding torques up to 250 oz-inches.
Eastern Air Devices Inc.
1 Progress Dr.
Dover, NH 03820
FAX (603) 742-9080
Circle 855

SENSOR

E3X-NL photoelectric, fiber-optic sensor detects subtle changes in luster, such as glossy labels on paperboard and grease on parts. The luster sensor heads feature two sensing ranges for different applications: 10 mm ±3 mm for short sensing distances and 20 mm ±7 mm for longer sensing distances. A fuzzy logic teaching function automatically changes the detection from glossiness difference to light-value difference detection when variations in luster drop below a minimum detectable level. Applications include labeling and labelers, electronic appliances, and pharmaceuticals.
Omron Electronics Inc.
1 E. Commerce Dr.
Schaumburg, IL 60173
FAX (847) 843-8081
Circle 856

BALL BEARING HOUSED UNITS

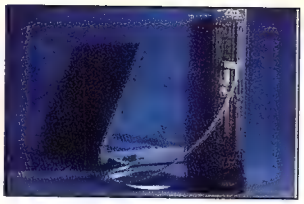
SURVIVOR® PT ball bearing housed units offer corrosion resistance. An advanced polymer housing provides protection with high load capacity. In addition, a ball bearing insert resists corrosion with a Fafnir TDC® thin, dense-chrome coating that does not crack or peel under tough conditions. Applications include food processing and packaging, bottling, chemical, paper, and material-handling.
The Torrington Co.
Box 1008
Torrington, CT 06790
FAX (860) 496-3625
Circle 857

AUTOMATION CONTROLLERS

Automation controllers provide motion control, PLC capability, communications, and programmable-limit-switch (PLS) capability in a single package. The PLS function allows rapid response of digital outputs based upon servomotor positions, with repeatability to one millisecond. Programming the controllers is simple and fully integrated into Quickstep™ State Language.
Control Technology Corp.
25 South St.
Hopkinton, MA 01748
FAX (508) 497-0451
Circle 858

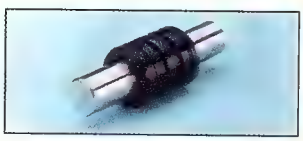
CLUTCH/BRAKE

Air Champ® clutch/brake product includes an integrated pneumatic valve to control clutch and brake functions. This miniature four-way, solenoid-operated air valve mounts directly to the clutch/brake, reducing the number of air line connections required. Air-operated clutch/brake response also improves with the integral valve because pressure drop is minimized. The Air Champ Integral Valve is available in combination with a locking key mechanism, which provides a backlash and wear-free connection between the clutch/brake output shaft keyway and its companion drive component.
Horton Inc.
1170 15th Ave. S.E.
Minneapolis, MN 55414
Circle 859



MOTION CONTROLLERS

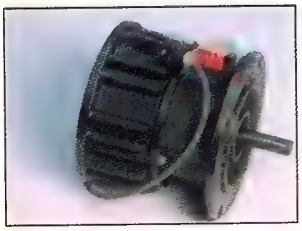
DMC-2000 Series motion controllers for the Universal Serial Bus (USB) are available in 1- to 8-axis format for control of both step and servo motors on any combination of axes. The motion controllers provide communication options including the new USB, RS232, RS422, and RS485 up to 115K baud. Nonvolatile memory for application programs, variables, and arrays permits operation without a host computer. Multitasking allows simultaneous execution of up to eight application programs.
Galil Motion Control
203 Ravendale Dr.
Mountain View, CA 94043
FAX (650) 967-1751
Circle 860



BEARING

FluoroNyliner bearing is composite lined and provides smooth, low-friction, linear and rotary operation under harsh conditions. The bearing operates without additional lubrication in contaminated, washdown, and submerged conditions and in a vacuum. The highly wear-resistant composite liner withstands shock and vibration, temperatures to 600F, high speed, rapid acceleration, short strokes, weld spatter, and aggresive chemicals. The bearing comes in closed, open, and self-align ing designs.
Thomson Industries Inc.
2 Channel Dr.
Port Washington, NY 11050
FAX (516) 883-9039
Circle 861

PRODUCTS



INTERFACE

Motion control and operator interface package integrates hardware and software to provide a complete solution for small to medium form, fill, and seal (FFS) machinery. The software includes a Windows UI and control program, and hardware includes an advanced, modular motion controller with multi-tasking and I/O capability. The motion control card eliminates the need for a PLC. An operator interface allows parameters such as bag length and speed to be input from the keyboard.

Precision Motion Control Corp.
2075-N Corte del Nogal
Carlsbad, CA 92009
FAX (760) 930-0222
Circle 862

MOLDING EQUIPMENT

Brochure introduces Instapak® foam-in-bag molding equipment which includes three systems that produce protective cushions for products that require a consistent, precise fit and engineered protection. The line consists of the Instapak twin vertical-molding station, the Instapak molding wheel, and the Instamolder® cushion molding system. These machines produce up to 100, 300, and 600 protective cushions per hour, respectively.

Sealed Air Corp.
Engineered Products Div.
10 Old Sherman Tpke.
Danbury, CT 06810
FAX (203) 791-3618
Circle 863

LINEAR BEARINGS

DryLin linear bearings combine an insertable gliding surface, made from a low-friction iglide material, with an anodized aluminum adapter for maximum performance and accessibility. The design enables direct interchange with standard ball bearings. The removable polymer insert offers self-lubricating, maintenance-free, contaminant-resistant performance; high-wear resistance; and a low, stable coefficient of friction.

igus inc.
Box 14349
East Providence, RI 02914
FAX (401) 438-7680
Circle 864

POUCH DISPENSER

SP-110 SUR-PAK pouch dispenser is a high-speed, low-maintenance dispenser which inserts medium-sized pouched products up to 60 gm in weight into another packaging operation at a rate off 300 pouches/min. It can handle pouches up to 4 inches wide and 3/8 inch thick. Applications include slippery film webs, cut-off registration verification, and food ingredient pouches.

AZCO Corp.
385 Falmouth Ave.
Elmwood Park, NJ 07480
FAX (201) 791-8420
Circle 865

GEARHEADS

Servofit™ precision planetary gearheads feature HeliCamber™ gear technology to reduce backlash, gear noise, and wear. All planet gears are hardened and ground to eliminate any irregularities that may generate pulsations in the drive train. ServoFit gearheads provide 3 arc/min backlash minimum and are available with 1 arc/min backlash.

Stober Drives Inc.
1781 Downing Dr.
Maysville, KY 41056
FAX (606) 759-5045
Circle 866

AC SERVO DRIVES

ECODRIVE-03 digital ac servo drives incorporate functions such as electronic gearing, high-speed registration, and electronic camming. The drives also integrate motion control, amplifier, power supply, and axis I/O functions into a single unit. Packaging uses include infeeders, form-fill-seal machines, wrappers, cartoners, case packers, and palletizers.

Mannesmann Rexroth Corp.
Indramat Div.
5150 Prairie Stone Pkwy.
Hoffman Estates, IL 60192
FAX (847) 645-6201
Circle 867

CLUTCH

EAS7 compact, mechanical, torque-limiting clutch features backlash-free torque transmission. The clutch offers a proprietary spring design for instantaneous response, low inertias, time-saving torque calibration, a radially accessible adjusting nut, and a keyless shaft/hub connection. The EAS7 is available in multiple configurations and five sizes, with torque capacities from 44 to 6, 195 inch-lbs and bores from 3/8 inch to 2 1/8 inches.

Mayr
4 North St.
Waldwick, NJ 07463
FAX (201) 445-8019
Circle 868

PRODUCTS

MOTOR

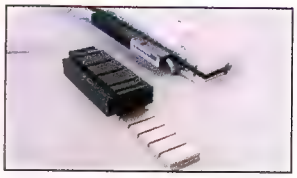
Size 34 brushless dc motor delivers up to 2 hp from a frame size of 3.75 inches diameter. This three-phase motor is rated for 160 or 230V operation with continuous torque ratings of 140 oz-inches at 7,200 rpm and 300 oz-inches at 6,700 rpm, respectively. Features include a totally enclosed integral cooling fan and special finned housing that allow the motor to generate high power while protecting from overheating.

Eastern Air Devices Inc.
1 Progress Dr.
Dover, NH 03820
FAX (603) 742-9080
Circle 869

MOLDED SILICONE

Capabilities for custom-molded silicone parts include heat seal applications for Rollstock or tray feed, form, and seal equipment. Push-in tee type gaskets replace sheet gluing and trimming to eliminate down time.

Inter-Tech Supplies Inc.
649 E. Green St.
Allentown, PA 18103
FAX (610) 435-5999
Circle 870



MOTOR

PLATINUM™ DDL (Direct Drive Linear) high-performance, brushless, permanent magnet motor consists of two constructions: ironcore and ironless. The ironcore motor has a high rated force per frame size and a patented anti-cogging design without the need for magnet skewing. The ironless motor has no attractive force between the coil and magnet components and zero cogging for smooth motion.

Kollmorgen
201 Rock Rd.
Radford, VA 24141
FAX (540) 731-0847.
Circle 871

PACKAGING COMPONENTS

Company offers services for internal assembly-line and industrial packaging components for biomedical, electronic, and systems designers. Services include pressure-sensitive adhesive solutions, and shapes and configurations of die- and laser-cut precision. The company also develops components for extremely high-temperature operations; multi-layered "island-placed" asymmetrical parts; precisely scored and perforated insulators; and RFI-shielded, closed-cell foam gaskets, seals, and closures.

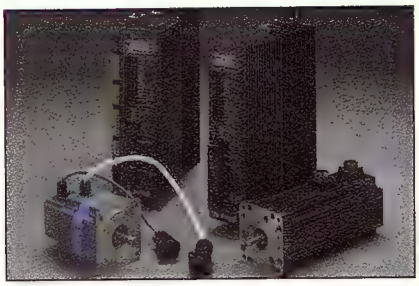
Topflight Corp.
Corporate Comm. Office
Box 2847
York, PA 17405
FAX (717) 227-1415
Circle 872

PRODUCTS

LASER SENSOR

BOD-26 laser distance sensor indicates object position to 80 µm resolution. The sensor features a red laser light and needle-sharp dot size of 0.9 mm, targeting it for non-contact dimensional measurement checks of small objects. The BOD-26 uses triangulation to determine distance to objects. Target distance corresponds to the sensor's analog output voltage. Operational sensing range is 45 to 85 mm.

Balluff
8125 Holton Dr.
Florence, KY 41042
FAX (606) 727-4823
Circle 873



SERVO SYSTEMS

SLO-SYN® TD/TDC Series brushless dc servo amplifiers and servo positioning systems are compact stand-alone units that include an integral power supply. Ac input voltage ranges from 95 to 264V ac. TD/TDC servo amplifiers drive NEMA 23, 34, and 42 brushless SLO-SYN servo motors with output torque rating 5 to 120 inch-lbs at speeds to 5,000 rpm.

Warner Electric
Motors and Controls Div.
640 Avis Dr.
Suite 200
Ann Arbor, MI 48109
FAX (800) 766-6366
Circle 874

CONTROLLER

Series 96 1/16 DIN dual-display controller features hardware modules that are pluggable and exchangeable and software menus that may be self programmed. The controller can be programmed to perform temperature measurements, event switching, remote set-point input, heating, cooling, alarms, digital communications, and retransmit. Applications include shrink wrapping, heat sealing, and hot-melt glue labeling.

Watlow Controls
1241 Bundy Blvd.
Winona, MN 55987
FAX (507) 452-4507
Circle 875

AIR CYLINDERS

M Series miniature air cylinders are useful as actuators in applications where space is limited. MA models feature a threaded body, allowing mounting in any surface where a hole can be drilled. MN models feature a threaded nose. MF models are flat-mount cylinders with a rectangular body. All cylinders are available in both single and double-acting models.

Mead Fluid Dynamics Inc.
4114 N. Knox Avenue
Chicago, IL 60641
FAX (773) 685-7002
Circle 876

MOTORS

Motors with NEMA frame styles have torque capabilities to 90 inch-lbs with encoder, resolver, brake, and IP65 options. Amplifiers are offered in six-step or sinusoidal commutation, and have velocity or torque mode capability. Multiaxis systems can be configured with a single ac drive powering up to three equivalent dc drives off the single dc bus.

MFM Technology
200 13th Ave.
Ronkonkoma, NY 11779
FAX (516) 467-5176.
Circle 877

CONTROL

MachineLogic™ IEC 1131-3 control package brings soft control to automation users. It runs on any PC or PowerStation workstation, eliminates the need for the PLC CPU, and optimizes performance by allowing 16 tasks to run simultaneously, all at different scan rates. MachineLogic operates stand alone or in conjunction with MMI software.

CTC Parker Automation
50 W. TechneCenter Dr.
Milford, OH 45150
FAX (513) 831-5042
Circle 878

COUPLING

RADEX® NN power transmission disc coupling provides zero backlash torque transmission and features a flexible disc design to improve torque ratings. The coupling consists of machined-steel hubs and a stainless-steel laminate package that allows angular and parallel misalignment and axial travel. Nominal torque ratings range from 130 to 79,650 lb-inches.

KTR Corp.
Box 9065
Michigan City, IN 46361
FAX (219) 872-9150
Circle 879

INTERFACES

Operator interface terminals include the OIT3165, which features a 2-line by 20-character backlit LCD, and the OIT3175, which features a 4-line by 20-character backlit LCD. User-definable keys let users configure the terminal with the exact keys their packaging application requires and to arrange those keys in any order.

Maple Systems Inc.
1930 220th St. S.E.
Suite 101
Bothell, WA 98021-8471
FAX (425) 486-4589
Circle 880

ADVERTISER INDEX

VENDOR-SUPPLIED CASE HISTORY

Controller gives accuracy, reliability

Doboy Div. of SIG Packaging Technology North America Inc. needed a reliable and accurate controlling method for assembling cartons at up to 70 cycles/min with its model 7510 Carton and Tray Former for glue-formed cartons. It found the answer in the Control Technology Corp.'s model 2600XM Automation Controller.

Doboy 7000 Series Carton and Tray Formers apply servo motor control with simplified mechanical motion to ease setup and maintenance, yet keep the rugged 3-shift-a-day operation. With model 7510, accurate placement of glue on each carton is vitally important to a successful carton-forming procedure. On cartons for Little Debbie® snack cakes, for example, four glue strips are applied along two edges of the carton at a speed of up to 72 inches/second with an accuracy tolerance of 0.2 inch per each glue strip. In this application, the 2600XM controller is able to manage as many as 16 glue heads while controlling three servo axes and about 45 I/O points.

The 7510 features an independent shuttle motion for accurate glue placement on carton blanks using electronically geared servo axes. Doboy specifies the CTC 2600XM Automation Controller to meet its exacting standards for accuracy and reliability in the gluing portion of its carton and tray former operations. Meeting such accuracy requires very rapid response and repeatability. CTC has embedded this functionality in its 2600XM integrated controller in the form of a Programmable Limit Switch (PLS).

The PLS turns specific outputs on and off at certain motor positions and responds very rapidly. When the packaging process requires a changeover to new criteria, the PLS and package-type parameters are readily reprogrammed to new specifications and the machine operation continues with minimal interruption. CTC controllers also feature Quickstep™ state language, which dramatically reduces programming time.

CTC has been improving machine automation for 23 years. Its headquarters are in Massachusetts with centers in Wisconsin and Northern California. Circle 802

OPEN, MODULAR, *and* SCALABLE *controls propel packaging profits*

Dan Throne
Manager
Packaging Business Unit
Indramat Div.
Mannesmann Rexroth
Hoffman Estates, Illinois

For 10 of the past 13 years at Indramat, Dan Throne has sold end users on the concept of using Indramat's servo technology to automate their packaging lines. Probing the requirements of modern factory floors, Throne focuses on the marketing and application of Indramat's control and drive technologies to help OEMs design and build more modular and competitive packaging equipment. He holds a Bachelor's degree in electronics from DeVry Institute of Technology.

DESIGN NEWS: What is driving the use of servo technology to automate packaging machines?

THRONE: In today's competitive environment, the need to decrease the per-unit costs on packaging lines is a given. As more end users strive for higher throughputs and faster changeovers, servo content on packaging equipment continues to increase. The next factor is reliability over the life of the machine. This is where Indramat's experience in harsh machine-tool-type applications and the added diagnostic information we provide has proven extremely useful. Our equipment is bullet-proof. It handles even the toughest environments and is easily maintained regardless of the skill level at the particular facility.

Q: "Open" architecture seems to be an industry buzzword that means something different to almost everyone. How do you define it?

A: Just to be practical, an open system is one in which interoperability exists between key components in the control system. In motion control, this means that servo drives from one vendor can communicate with motion controllers from other vendors. In the past, ±10V analog signals were the communications standard between drives and controls. But converting signals from digital drives to analog, then back to digital at the controller, eliminates the benefits of digital technology, such as extensive diagnostics. That's why SERCOS (SErial Real-time COmmunication System) was developed and adopted as the international standard for digital communications between digital drives and controls. To be "open," a motion controller also needs to be able to easily pass back and forth vital diagnostics, mode changes, and program upload/download with PLCs, HMI, and the operating system being used. A motion controller can reside inside a PC-based architecture, which is the de facto standard, or it can be a stand alone form factor and still provide multivendor connectivity through SERCOS, fieldbuses, a Windows operating system, and other communications standards such as Ethernet. These interfaces all meet popular definitions of "open," which include public availability of the specification at reasonable cost.

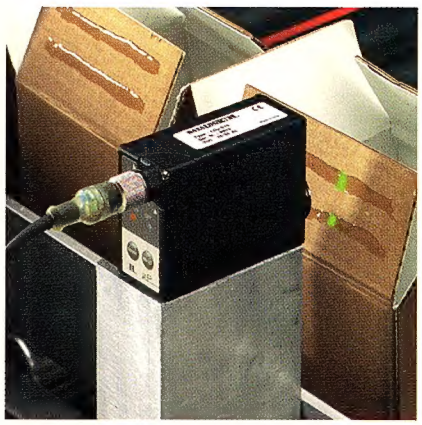
Q: What are the fastest growing packaging applications for servo technology?

A: Engineers want to automate the bottlenecks in a packaging line in an effort to increase production and drive down the per-unit costs. Flow wrappers and cartoners are two good examples. Nowadays, there may be anywhere from eight to 15 servo axes on these types of machines. And many machine builders are completely automating changeover and set-up of the machines.

Q: 1998 seems to be the year of the network. How is networking technology being applied in packaging?

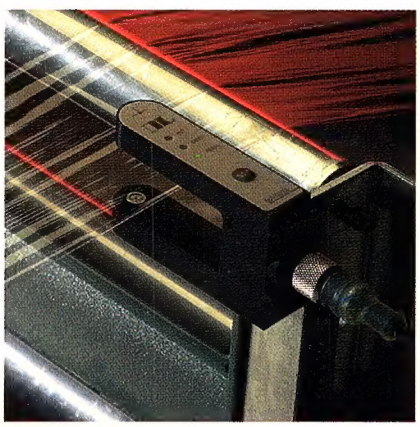
A: Large end-users want to network their machines together even if the machines are from various suppliers from different countries. One advantage of this would be that all machines could share common controls and HMIs. An operator standing at one machine could monitor or diagnose what is going on at another machine downstream. OEMs and end users alike push for more diagnostics. The result is more effective troubleshooting, preemptive maintenance, and continuous process improvements. Lastly, there is a lot of interest in teleservice or remote diagnostic capabilities. The modem with our controller provides this capability.

Packaging SOLUTIONS from Balluff



LDμ Luminescence Features

- Detect invisible fluorescent targets
- Microprocessor control
- Solid-state LED light source
- Simple setup - auto learning
- Connector or cable versions available
- 2 kHz Switching frequency



SR25 Family Features

- Wide 25mm slot opening
- Automatic setting
- 80μs response time
- NPN and PNP outputs
- Industry standard quick-disconnect connector

TEC Color Sensor Features

- Full color spectrum sensing
- Automatic setting with the touch of a button
- Highly sensitive to even subtle shade changes of the same color
- Visible emission
- Plastic fiber optic cable with 8mm sensing head gets into tight locations

Just a few Application Solutions...

LDμ Luminescence Detector

sorting/reject marks on any material

threads in the textile industry

application of glue during packaging

presence of safety seals

■

SR25 Slot Sensor

transparent film detection

edge guides

packaging/wrapping machinery

hole and buttonhole check on thick material

■

TEC Color Sensor

quality control of product finish

color based object detection

color consistency monitoring

label detection

See us at PACK EXPO Nov. 8-12 Booth #8334

BALLUFF

Sensors for Automation

www.balluff.com

Balluff Inc. • 8125 Holton Drive • Florence, KY 41042 • 1-800-543-8390 • www.balluff.com

Circle 801

Delivering Internet Technology to the Factory Floor

control.com®

When you have to go beyond machine control, to communicate information to operators, quality assurance, plant managers and others...

When you need to maintain equipment thousands of miles away...

When high-performance, highly integrated control is more important than ever...

It's time to go beyond PLCs to control.com. Combining control and communications, these powerful automation systems master servo control, stepping motors, digital+analog I/O with ease, while providing a built-in World Wide Web interface*. It's all integrated in a single package, with a single easy-to-use language for rapid new equipment development.

Digital • Analog • Motion Control • Internet

* Manufactured Under U.S. Patent 5,805,442

Write for the new White Paper "Securing Remote Access to Plant Intranets." It will help you keep pace with changing times.

Today, CTC delivers a full range of high-performance control hardware, backed by powerful state-of-the-art software that puts you ahead of the crowd. Our patented internet technology continues a tradition of innovation extending back nearly 25 years.

Quickstep and control.com are trademarks of Control Technology Corporation.

Control Technology Corporation

Control Technology Corporation 25 South Street, Hopkinton, MA 01748
508-435-9595 • 800-282-5008 • Fax: 508-435-2373 • info@control.com • http://www.control.com/

Circle 802